WIRE AND WIRE PRODUCTS

OCTOBER 1960

IT TOOK 89 STEPS

TO BRING YOU
THE MOST MODERN AND
COMPLETE LINE OF
COLD DRAWING EQUIPMENT
IN ALL THE WORLD

The VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.

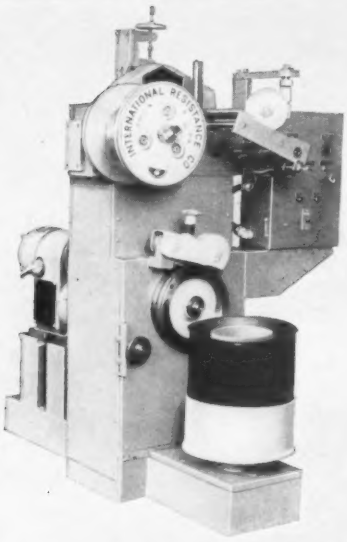
see pages 1351, 1352, 1353 & 1354

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

COULTER & McKENZIE

CONSTANT TENSION DRAW-PAK EQUIPMENT

FOR CONTINUOUS WIRE PACKING & DRAWING

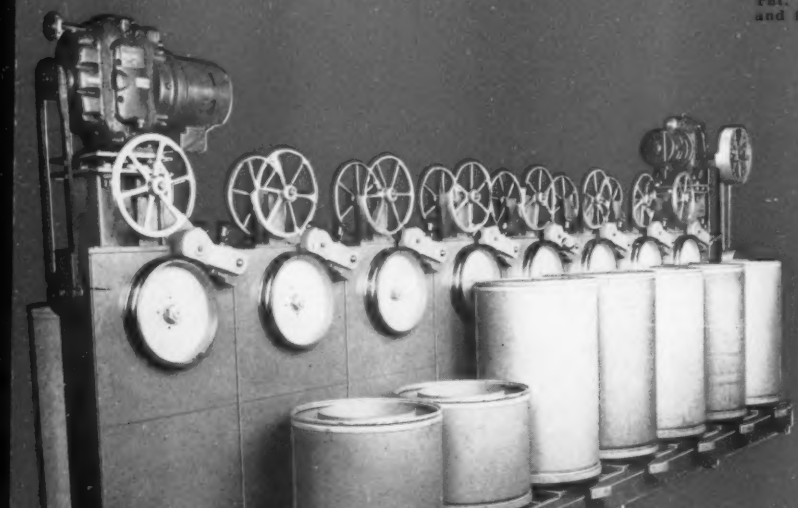


- Combination drum or spool take-up and rewinder.
- Shown for single wire.
- Adjustable for tension, pitch and amplitude of traverse.
- 12″ spool shown. 30 to 150 lb. drums.

MODEL C-100 TAKE-UP

- Shown with single drive mounting to 16 wires .008″ to .051″
- Enameling, annealing, galvanizing, tinning, etc.
- Containers 30 to 150 lbs.

Pat. No. 2,732,[illegible]0. Other U.S. and foreign patents pending.



MODEL C-500 TAKE-UP

- Shown with tandem drive mounting 8 wires each side .020″ to .250″.
- Galvanizing, patenting, enameling, etc.
- Drum or adapter weights 200 to 1,000 lbs.

MODEL 138-A DRAW BLOCK

- Single draft wires .016″ to .375″
- "Draw-cast" die box shown gives adjustable positive cast control. Also available in other sizes.
- Process adapters to order — drums to 1,000 lbs.

Your inquiry specifying the application which is of interest to you will result in prompt and courteous attention.

Barron & Crowther Ltd., Eastleigh, Ha England. European Draw-Pak License Idos Industries Ltd., Royston, Herts England, Sales Agents.

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Standard Industrial

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YOU and YOUR WIFE

to

"Swing and Sway
the Standard Way"

in

Our Suites 208-9-10
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during
The Annual Wire Association Convention
NOVEMBER 14th THRU THE 17th
1960

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Standard Industrial
COMPOUNDS CO., INC.
Member WAS

FRANKFORT, ILLINOIS
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Telephones: 2131 - 2141

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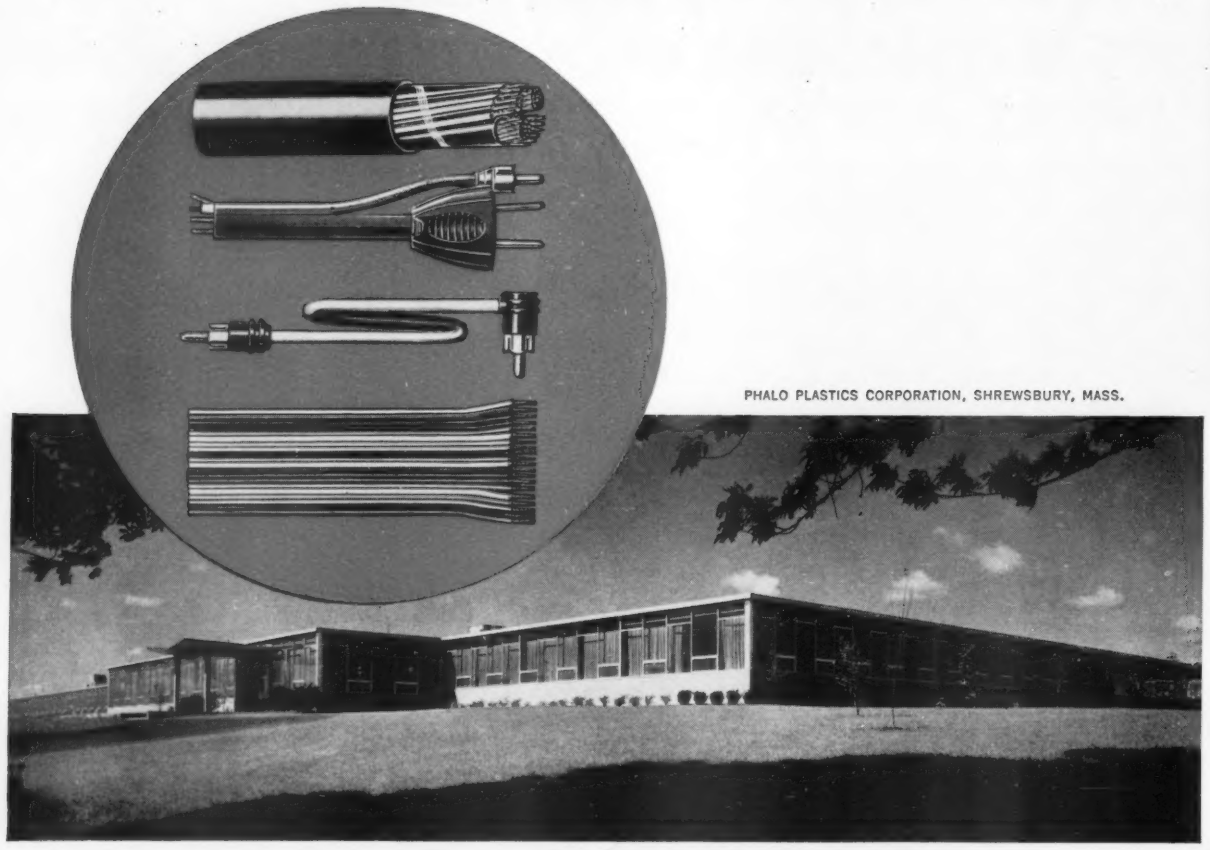
Canadian Manufacturer:
H. L. Blachford Ltd., 977 Aqueduct St., Montreal, Que.
H. L. Blachford Ltd., 40 Titan Rd., Toronto, Ont.

Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.



PHALO PLASTICS CORPORATION, SHREWSBURY, MASS.

HOW TEAMWORK PRODUCES QUALITY PRODUCTS FOR WIRE & CABLE USERS

Phalo Plastics Corp., Shrewsbury, Massachusetts, a leading wire and cable manufacturer, and The Blane Corporation, insulation specialists, have teamed together to solve industry needs.

For example, in 1958, the industry required a 105°C Compound having both good high and low temperature properties. To meet this need Blane developed #2105 and Phalo pioneered its use in UL 105°C applications as well as for CSA requirements.

In 1959, Blane's research and development team worked with Phalo's engineering staff to make available to the industry a vinyl insulation material meeting the critical UL tests of 7 days at 113°C in 1/64" wall thickness and 7 days at 121°C in 1/32" wall thickness with a good margin of safety.

The result is Blane's #8100 compound.

We salute Phalo Plastics Corp. for their rigid engineering requirements which assures the industry that only top performing materials will be used in their products.

Blane is proud to be one of the suppliers of this progressive company serving the wire, cable, and electronics industries.

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and a **Glader**

NAIL MACHINE

WITH YEARS OF PROVEN PERFORMANCE
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11 Sizes OF MACHINES

THAT COVER THE COMPLETE RANGE OF NAILS
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AND GUESTS OF
THE WIRE ASSOCIATION *TO CHICAGO!*

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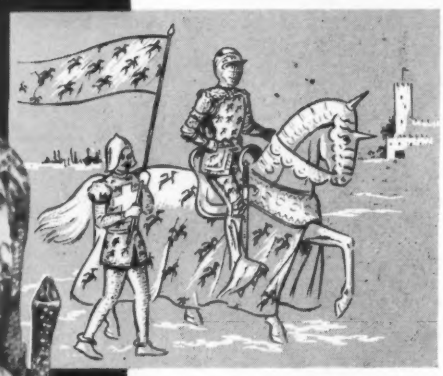
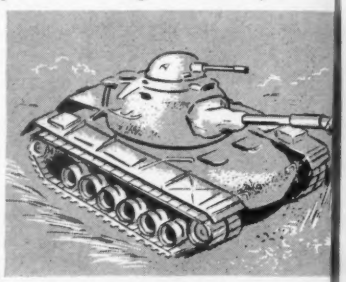


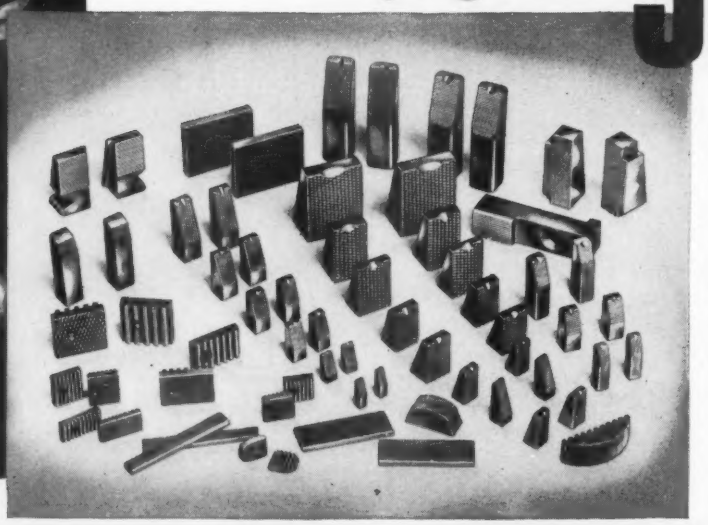
The Armorer provided many superb examples of craftsmanship . . . . . to take a leading place among the artists of the World who have worked in metals!

These ancient and medieval protective suits for knights of old were custom tailored—and great skill was required to forge, fit and join the many pieces of hard steel to shield a warrier in joust or battle. Some suits were resplendent with engraving and embossing in gold and silver.

Today, we armor plate our engines of war . . . rather than our men!



Sjogren JAWS



Sjogren combines craftsmanship in steel with the efficiency of modern methods . . . to produce the highest quality wire mill tools and special machinery . . . . .

USED BY WIRE MEN WHO WANT . . . THE BEST!

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WIRE AND WIRE PRODUCTS*

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol 35 October, 1960 No. 10

Designated as Official Publication By The Wire Association

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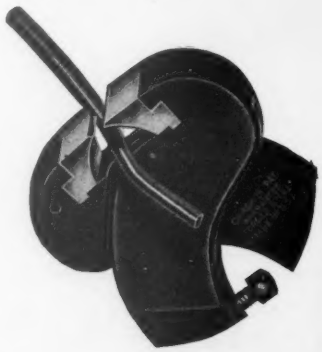
Carew cutters have given consistent quality unequaled in 90 years.



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Aluminized Wire

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WRITE FOR FREE SAMPLE

Longer piston wear at lower cost is a sure thing with Gillett and Eaton Insert Pistons. Why? For one reason, because they have a pre-shaped steel wire cast right in the piston wall where the top ring is located.

That wire insert is made of Sheffield Aluminized Wire. It's the only wire of its kind that stands up against excessive work hardening in this application. This is because of the extremely tight bond of aluminum coating on steel wire, made possible by Sheffield's patented method of making the wire. When cast in the piston wall, the aluminized wire forms a tight bond with the aluminum in which it is inserted. The exclusive Gillett & Eaton steel wire insert cuts top ring groove wear and greatly increases mileage between overhauls.

Whatever your use of aluminized wire, Sheffield metallurgical skill, engineering excellence and strict quality control assure you the wire that will do the best job. For further information, get in touch with your nearest Sheffield office.

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Large Continuous Electric Annealer VG 85 to be worked in combination with any copper rod break down machine, for bright annealed finished wire, for sizes between .14" and .048". Finishing Speeds up to 3000 to 4000 ft/min.

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Saw mill at Bradford, N. H., where logs are processed into lumber.

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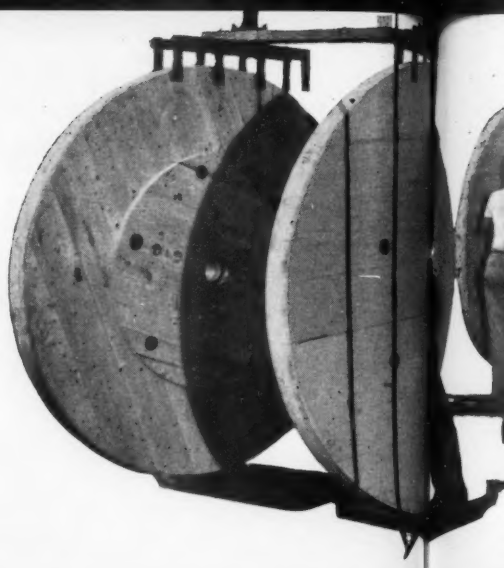
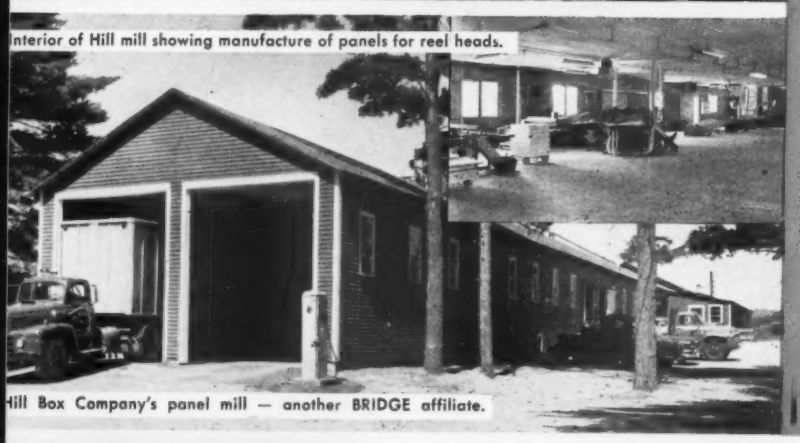


Interior of the Kearsarge plant.

Plant of Kearsarge Reel Co. — an affiliate of Bridge Manufacturing Co.



Interior of Hill mill showing manufacture of panels for reel heads.

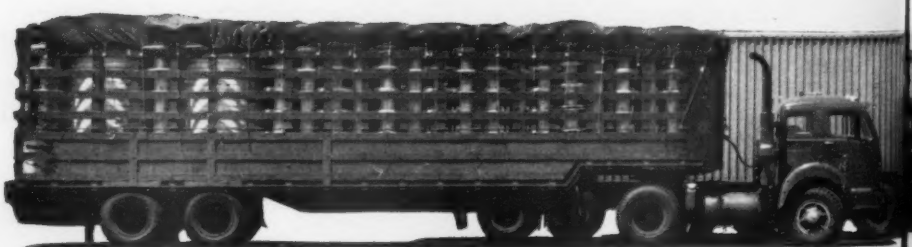
Hill Box Company's panel mill — another BRIDGE affiliate.

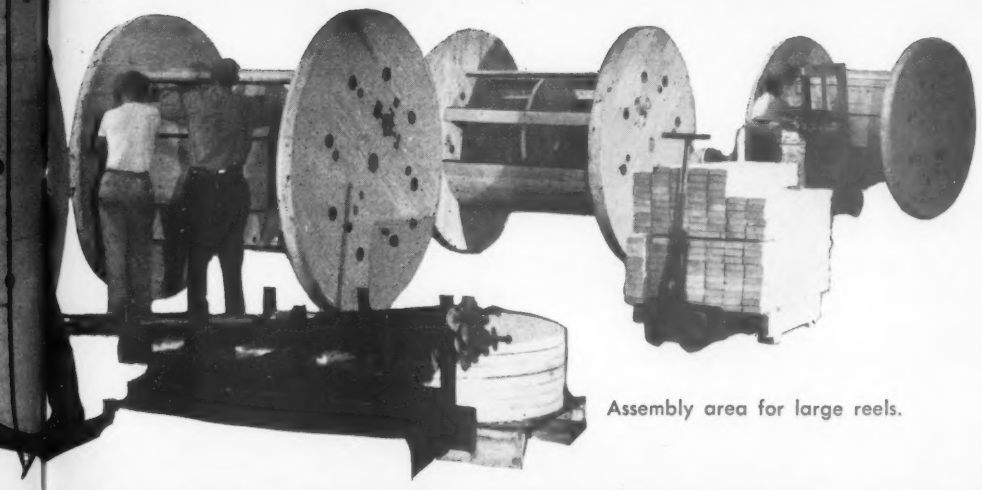
HOW BRIDGE SUPPLIES ONLY THE BEST REELS

Our company is old, but progressive. Since we began the manufacture of wood reels for wire, rope and electric cable, our plant has undergone a continuous process of expansion and improvement in production facilities — all to the end of making the finest reels and of reducing fabricating costs — listed are some of the factors entering into our ability to serve wire mills effectively and well.

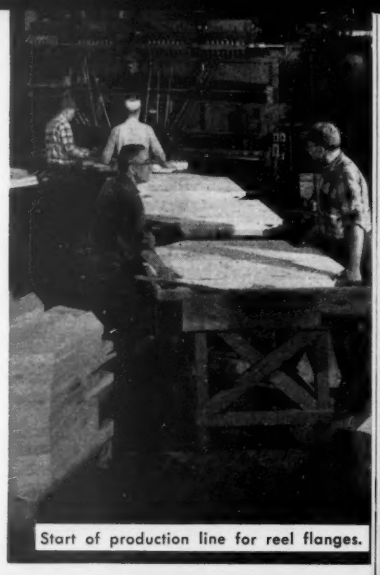
Planing and cutting round-edge lumber prior to forming into reel head panels.

HIGH-SPEED SHIPPING SERVICE IN OUR OWN FLEET OF TRUCKS WITHIN A RADIUS OF 250 MILES FROM THE PLANT.



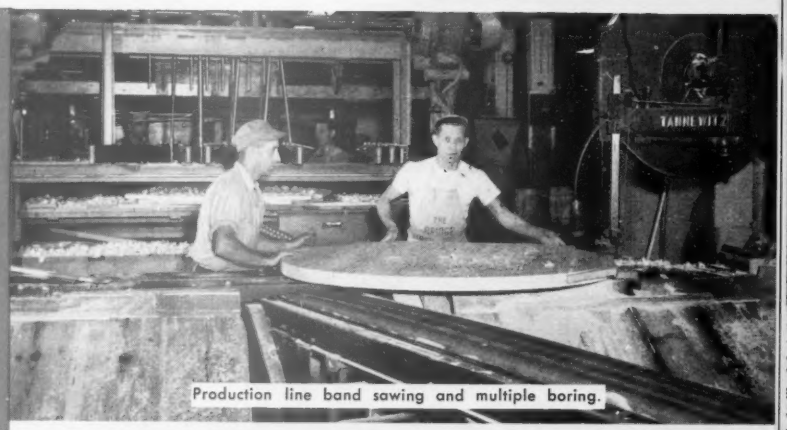


Assembly area for large reels.

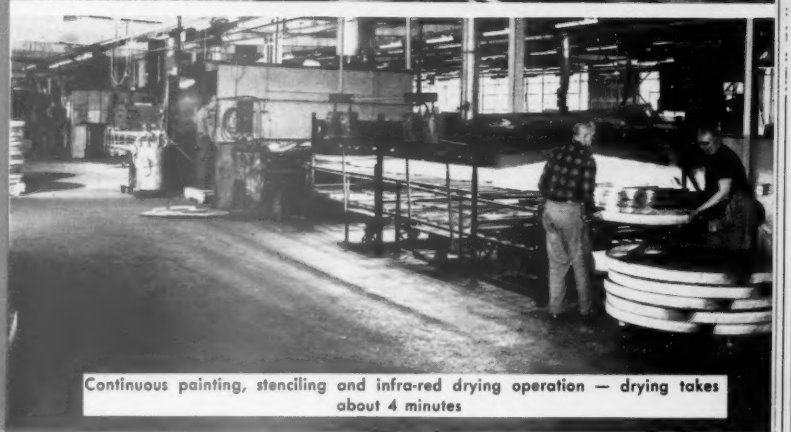


Start of production line for reel flanges.

- CONTROLLED SAW MILL OPERATIONS.
- CONVERSION OF LUMBER INTO PANELS AND SQUARE-EDGE LUMBER.
- MILLIONS OF BOARD FEET OF LUMBER ALWAYS IN INVENTORY.
- AIR SEASONING OF LUMBER — SUPPLEMENTED BY KILN DRYING.
- EFFICIENT, MODERN MATERIAL HANDLING EQUIPMENT FROM FOREST TO FINISHED REEL.
- LATEST AND FINEST REEL MANUFACTURING MACHINES—MANY MADE TO BRIDGE DESIGNS AND SPECIFICATIONS.
- FABRICATING METHODS CONTINUOUSLY IMPROVED.
- FAST, EFFICIENT STRAIGHT-LINE PRODUCTION FLOW OF WORK.
- PAINTING AND STENCILING COMPLETED IN APPROXIMATELY 4 MINUTES.
- REEL ASSEMBLY METHODS EMPLOY MANY MECHANICAL INNOVATIONS.
- OVERNIGHT DELIVERIES IN OUR OWN TRAILER TRUCKS. FAST FREIGHT USED FOR DISTANT POINTS.



Production line band sawing and multiple boring.



Continuous painting, stenciling and infra-red drying operation — drying takes about 4 minutes

LET US QUOTE YOU ON YOUR REEL NEEDS. SEND US YOUR SPECIFICATIONS. OR BETTER — VISIT OUR PLANT AND SEE HOW BRIDGE REELS ARE MADE.

BRIDGE

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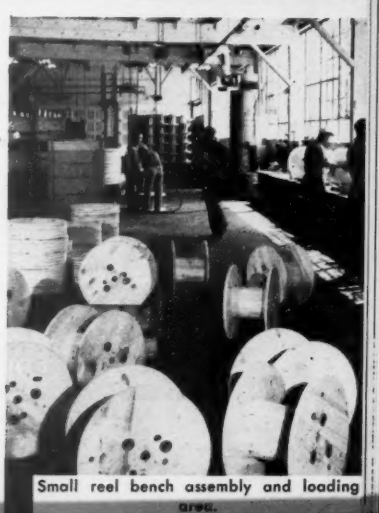
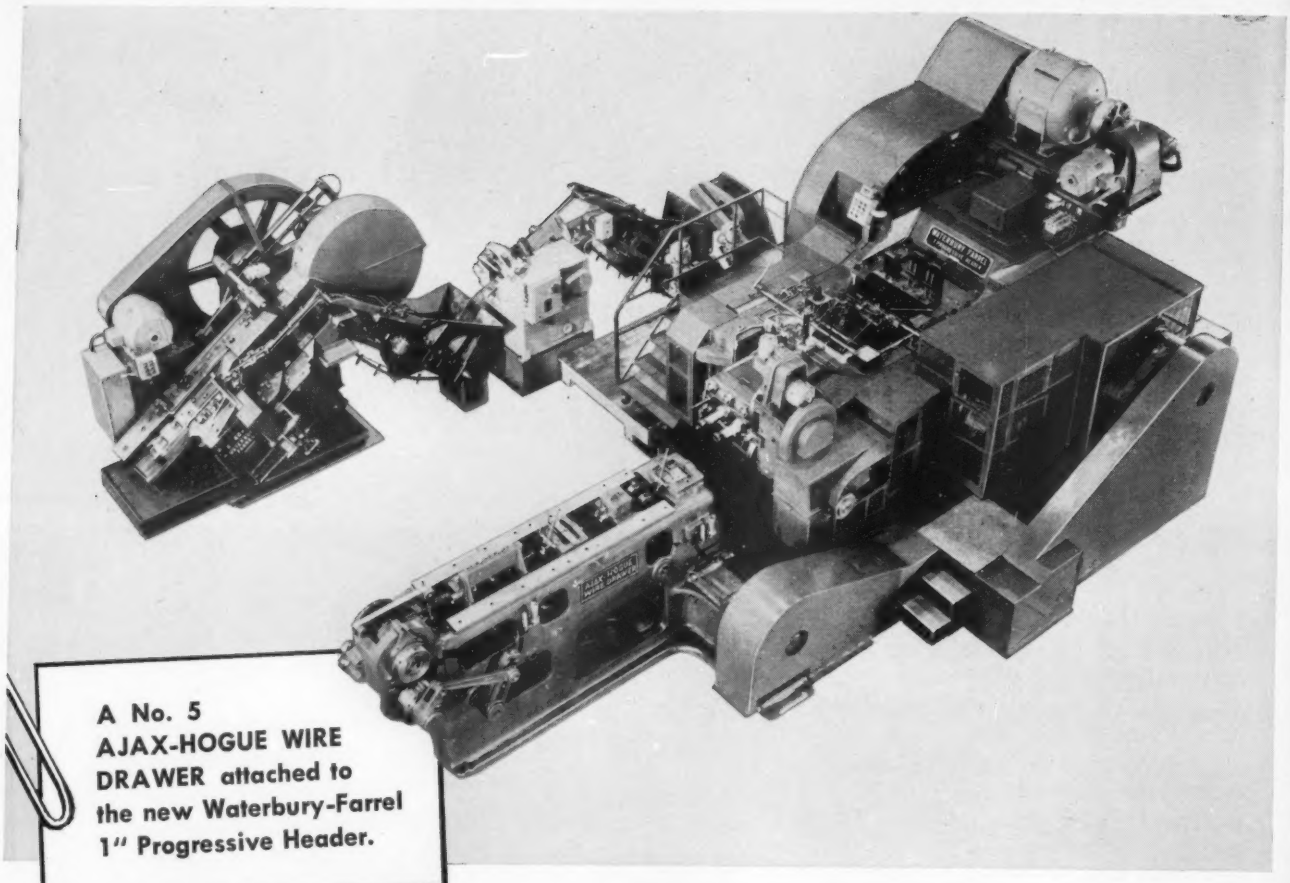


Small reel bench assembly and loading area.



A No. 5 AJAX-HOGUE WIRE DRAWER attached to the new Waterbury-Farrel 1" Progressive Header.

For Quality Production at Lower Cost COLD HEADERS Need . . .

AJAX-HOGUE Wire Drawers

AN ATTACHMENT FOR HEADERS AND COLD NUT FORMERS

THE AJAX-HOGUE WIRE DRAWER is a complete wire drawing unit, custom designed to fit any make cold header or cold nut former. It cold draws wire in a straight line and coats wire from hot-rolled, pickled and limed rod as it feeds into the header. You are sure of uniformly accurate size wire from successive coils. A wire drawer attached to your header assures easier heading, improved products and increased production. *Write for Bulletin 111-A.*

DESIGNED AND BUILT BY

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At Last! FULL AUTOMATION

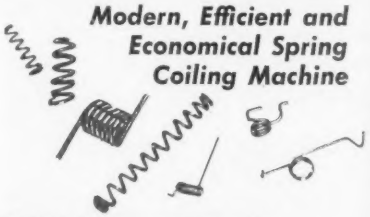
with

WAFIOS

AUTOMATIC

SPRING COILING MACHINE

Modern, Efficient and Economical Spring Coiling Machine

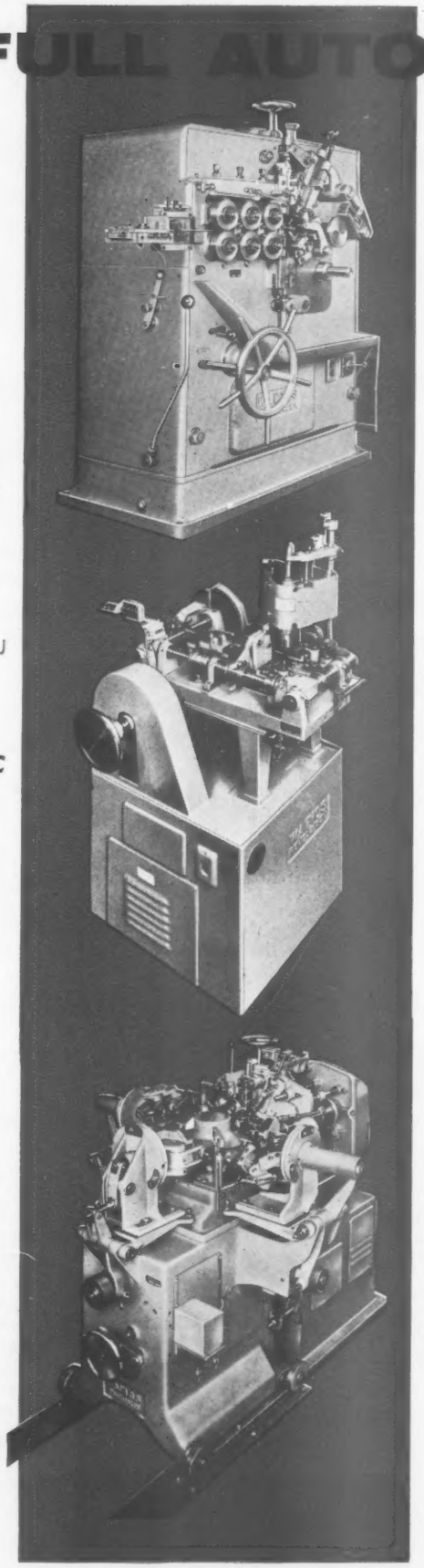


SFMU Universal Torsion SPRING COILING AUTOMATIC

This machine has been designed to eliminate expensive hand operation when manufacturing Torsion Springs with shanks having complex bends. It is possible to form complex shaped shanks with relatively simple tooling. This new series is available in three sizes with or without four bending slides to offer an extensive variety of applications. This series can handle wire diameters ranging from .008" to .177".

Series "ZO" Automatic Extension SPRING COILING and LOOPING MACHINE

The ZO permits the manufacture, untouched by hand, of right hand extension springs with loops at both ends. The loops may have any desired position relative to one another, and one loop end may be completely different in shape or position from the other. It is capable of producing up to 48 finished pieces per minute with loops on both ends. The ZO is available in 2 sizes for wire diameters ranging from .020" to .118", and springs from ⅜" to 8" long.



Model FM Automatic SPRING COILING MACHINE

This machine is unequalled for high production capacity, exact infinitely variable wire length regulation, and quiet operation. It is capable of handling different wire feed speeds. Almost all compression and tension springs can be mass produced with the FM series. There are five types available; — FM 4, FM 8, FM 15, FM 30, and FM 50. Capable of handling wire with diameters ranging from .004" to .197".

Complete specification bulletins are now available for each series. Write for complete information to:

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MACHINERY CORPORATION

61 HUDSON STREET
HACKENSACK, NEW JERSEY
Tel. HU 9-7577

WAFIOS MASCHINENFABRIK
Wagner, Ficker & Schmid

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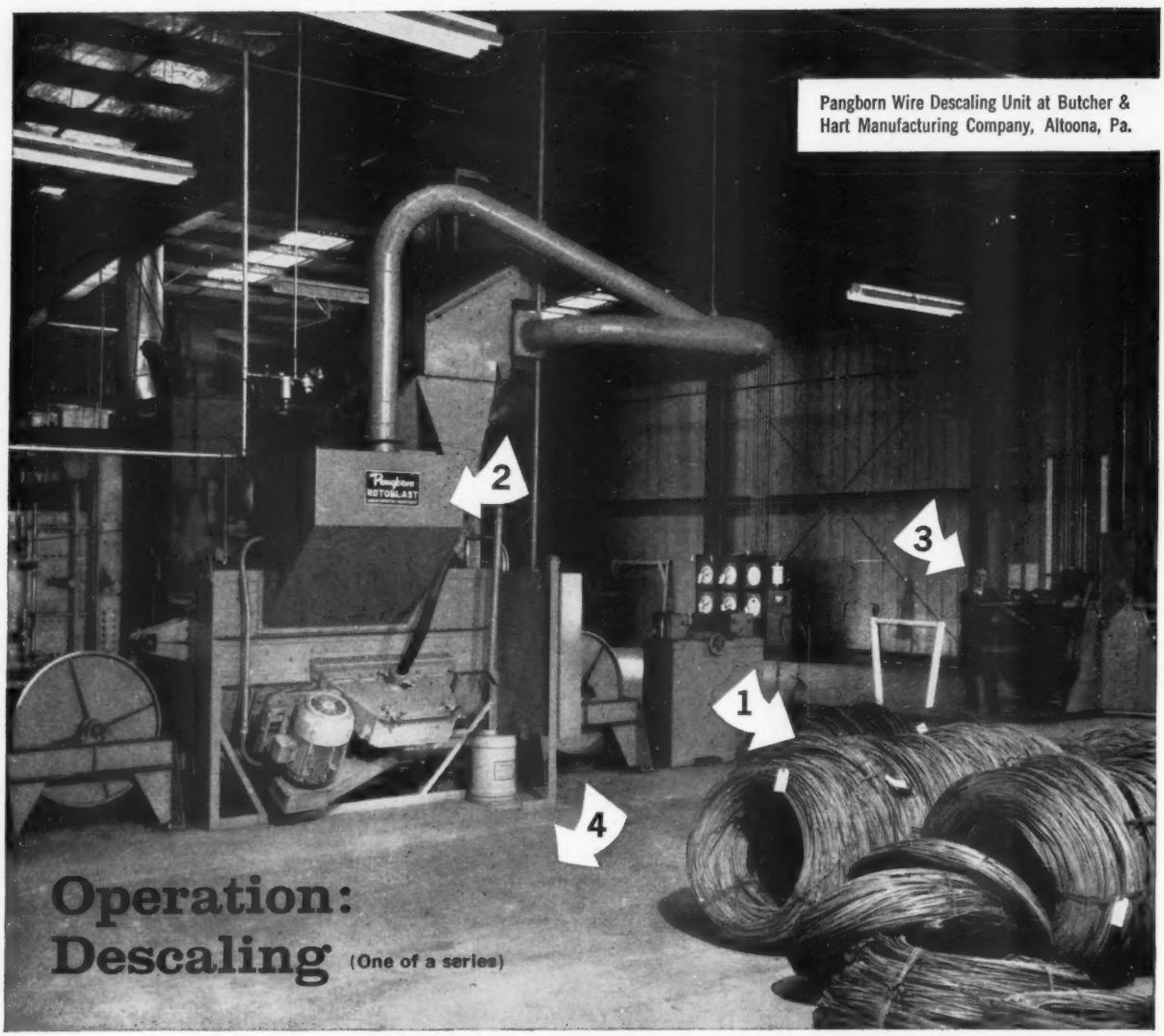


Q: Does Rotoblast end acid disposal problems?

A: Yes, and it cuts costs in the process.

1. Rotoblast eliminates loss of virgin metal

When wire and rod descaling is done through pickling, some virgin metal is invariably lost. Operating experience shows that there is no loss of virgin metal with Rotoblast Descaling. Also, there isn't any acid requiring disposal. Problems like water pollution are made obsolete in many areas of operation by Rotoblast.

2. Rotoblast reduces investments

With Rotoblast, savings on wire and rod descaling equipment can run as high as 70% on the original investment when compared with the investment required for pickling equipment.

3. Rotoblast minimizes descaling time

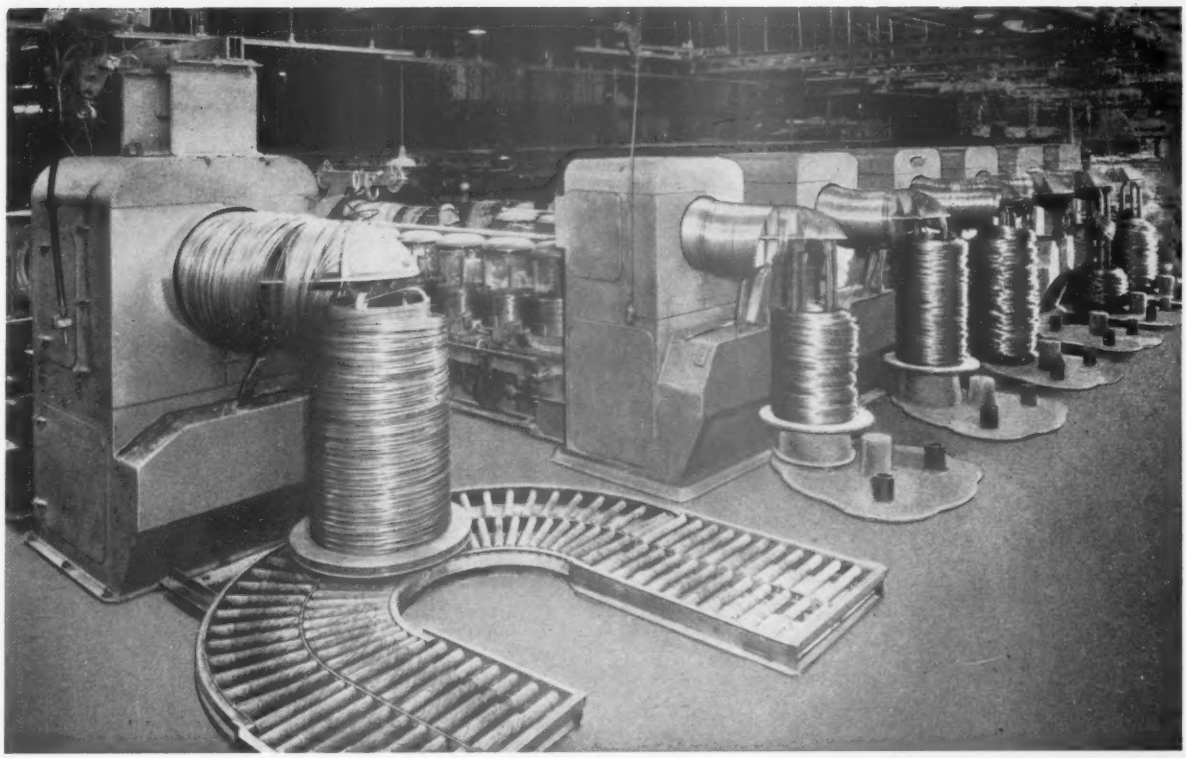
Wire and rod descaling goes faster with Pangborn Rotoblast than with pickling. Also, Rotoblast requires less manpower. Either way—or both—it cuts labor costs. (Following a patenting furnace, Rotoblast can descale multiple strands of wire, 40 or more at a time.)

4. Rotoblast frees space

Since Rotoblast requires only ¼ to ⅓ as much space as pickling equipment, it frees the difference in floor space for other operations. Also, this airless-blast machine can be easily installed in line with coating and drawing equipment to provide straight-through production. Rotoblast-cleaned surfaces are ideal for any type of coating or for drawing compounds.

You, too, can effect considerable savings with the Rotoblast Descaling Unit in your wire and rod descaling operations. Talk with your Pangborn representative or write: PANGBORN CORPORATION, 5400 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Blast Cleaning, Vibratory, Dust Control Equipment—Rotoblast® Steel Shot and Grit®.*

Pangborn
OF HAGERSTOWN



A portion of Whitacre Wire Drawing Dead Block installations at Sheffield Division of Armco Steel Corp. at Kansas City

FACTS SPEAK LOUDER THAN CLAIMS!

In actual operation Whitacre Wire Drawing Dead Blocks have delivered . . .

40%

Increase in Production

39%

Decrease in Costs!

Let us prove this statement. Investigate today!

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HERBORN

FOR STRAIGHT LINE DRAWING OF STEEL WIRE FROM .400" DIAMETER

VARIABLE SPEED THREE PHASE AC SLIPRING MOTOR DRIVE IS EXTREMELY POWERFUL. ALL CONTROL UNITS ARE MOUNTED ON THE MACHINE IN SPECIAL CONTROL CABINETS.

- *Beautiful 2-color technical catalog with complete information about the G Ia and other fine Herborn Wire Drawing Machines is yours on request.*

TYPE G Ia NON-SLIP
WIRE DRAWING MACHINE

This Herborn type G Ia wire drawing machine incorporates all the advantages of straight line wire drawing. The wire passes directly from block to block over only one reversing pulley located in front of the die holder (no unnecessary wire reversal). Draw blocks are provided with air and water cooling, the dies are water cooled. The gear drives provide the basic reduction. The fine adjustment is obtained by speed regulation of the A/C slipring motors.

NOTE: We also supply all types of wire drawing equipment for ferrous and non-ferrous metals.

HERBORN Machinery Corporation

61 HUDSON STREET • HACKENSACK, N. J. • Tel: HU. 9-7577

MASCHINENFABRIK-HERBORN

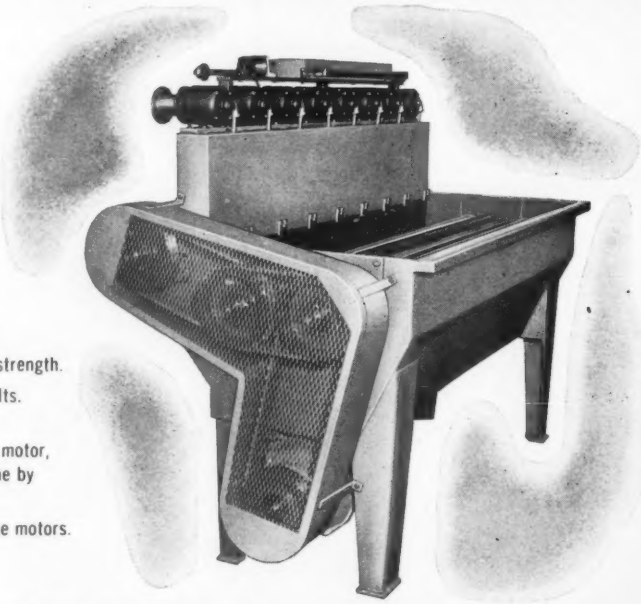
BERKENHOFF & DREBES HERBORN-DILLKREIS, GERMANY

STRAIGHT-ROLL WIRE DRAWING MACHINE

8 HEADER • 14 PASS • 1250 FPM • RUGGED • COMPACT • NO VIBRATION

The Watkins STRAIGHT-ROLL WIRE DRAWING MACHINE

Compact basic design, rugged construction and design detail for maximum rigidity give this machine the ability to handle 8 heads, each having 14 passes and a finishing die, at a wire speed of 1250 FPM and higher within a floor space of 40" x 77" without vibration.



ROLLS Two drive rolls, one capstan roll in close-coupled arrangement. 5" diameter. Easy removal.

TUB All-welded construction. Heavy plate.

SHAFTS 2" diameter. Journaled in heavy duty flange-type ball bearings. Shaft seals in tub walls.

DIE HOLDER Extra-heavy construction for maximum rigidity and strength.

MAIN DRIVE 7.5 HP 220/440 Volt electric motor. Double vee belts. Removable guard.

TRAVERSE Travel is adjustable from 3" to 6". Gearhead servo motor, controlled by limit switches, actuates traverse frame by rack and pinion drive. Mechanism enclosed.

SPOOLING Finished wire led to spools on shafts of eight torque motors. Individual ON-OFF and speed controls.

R S WIRE MACHINES

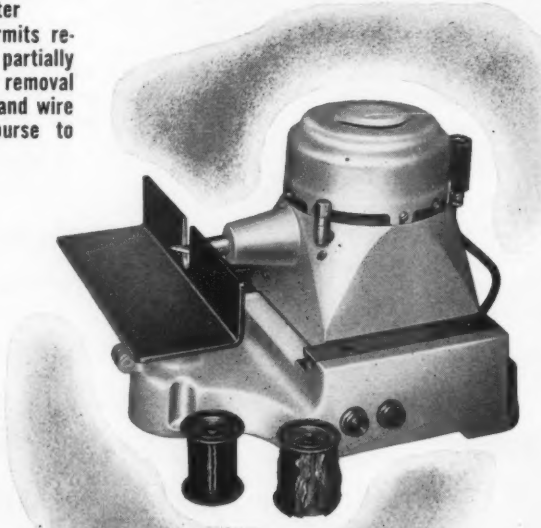
R. S. WATKINS & SONS, INC. Glen Road, Sandy Hook, Conn.

VIBRATING WIRE CUTTER

REMOVES WIRE FROM SPOOLS IN SECONDS

R S WIRE MACHINES

The Watkins Vibrating Wire Cutter is a unique machine that permits removal of fine wire from full or partially filled spools in seconds. Rapid removal allows spools to be reclaimed and wire to be salvaged without recourse to costly hand methods.



Revolutionary in design, the unique operating principle of the machine allows simple, straightforward construction with design features that contribute to ease of operation and long service life. Tests conducted under actual production operating conditions have proved unit capability. The simple operating procedure can be learned in a very short time. All mechanism is totally enclosed and operates in oil. The cutting member does not harm the spool, yet slices easily through any number of turns of wire without effort by the operator.

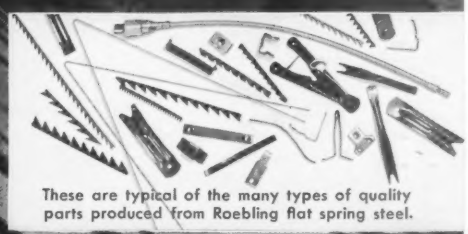
A guide table provides quick reference of spool position for optimum cutting action. Table position is adjustable to accommodate spools from 2" to 6" in diameter. Descriptive literature is available. Inquiries are invited.

R. S. WATKINS & SONS, INC. Glen Road, Sandy Hook, Conn.

Speaking of Records

. . . *our* records show that when a manufacturer once discovers the exceptional and uniform quality of Roebling flat spring steel, he becomes a permanent Roebling customer.

Your records for faster production and lower costs can be improved, in large measure, by Roebling's strict attention to supplying you with the finest flat spring steel available. When you need flat spring steel, specify Roebling. Write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey, for complete details.



These are typical of the many types of quality parts produced from Roebling flat spring steel.

ROEBLING

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John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation

Roebling . . . Your Product is Better for it

LOW COST

precision wire plating

UNIFORM COATINGS MAINTAINED AT HIGH SPEEDS

CONTINUOUS ELECTROPLATING EQUIPMENT

This low cost equipment performs with such ease and efficiency that it means real savings for you. Preset quality control insures perfection without depending on operators' skill. No toxic fumes, clean operation at low temperature, elimination of work hardening during processing, and many other features are the result of experience and sound engineering that go into the design of all Universal equipment.

We furnish complete installation . . .
For further information write to:

UNIVERSAL INDUSTRIAL EQUIPMENT CO.

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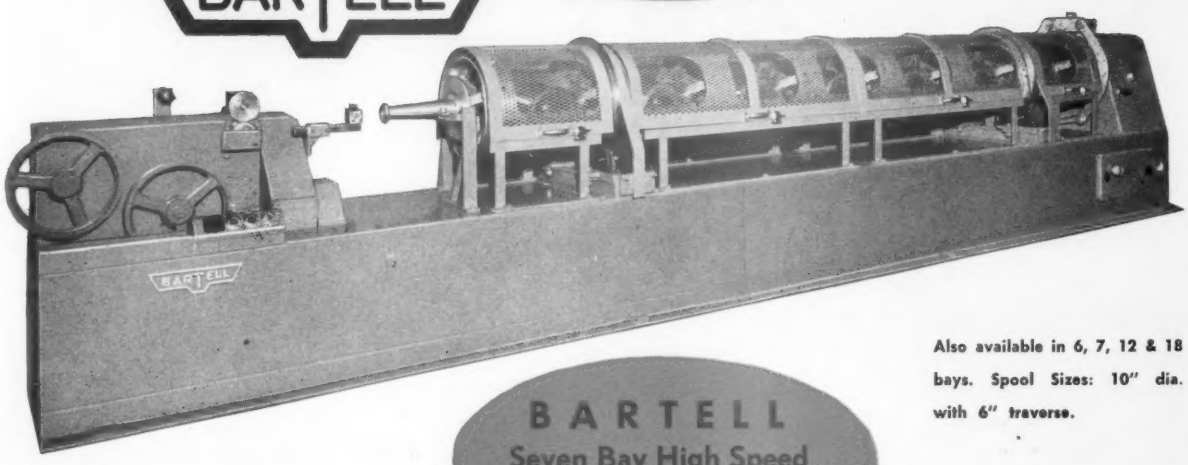
U. S. PATENT # 2823180 AND FOREIGN PATENTS PENDING

FOR THE BEST

BARTELL



Also available in 6, 7, 12 & 18 bays. Spool Sizes: 10" dia. with 6" traverse.

BARTELL
Seven Bay High Speed Strander
Model 7B-58-15

Frames are constructed of hot rolled shapes and plates to form a rigid box structure — Barrel is extruded 6062T-6 aluminum — Smooth starts through slip clutch driven by 7½ H.P. motor — Operators control station at front of machine — Main power control center at drive end — Electronically controlled automatic stop energizes solenoid operated brakes in event of wire breakage — Spool cradles and associated parts are completely interchangeable from one machine to another — Tungsten carbide wire guides throughout — Lay from ¼ in. to 5 in. long.

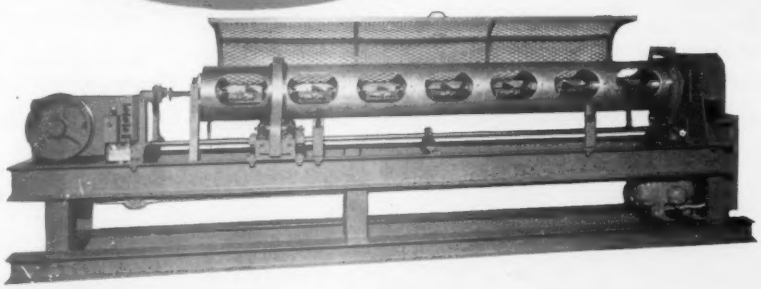
- CATERPILLAR CAPSTANS
- SINGLE & MULTIPLE HEAD RESPOOLERS
- WIRE STRANDERS
- TAKE-UP & PAY-OFF STANDS FOR PLATING EQUIPMENT

BARTELL

BARTELL
Seven Bay High Speed Strander
Model 7 B 55

WE ALSO DESIGN AND BUILD SPECIAL EQUIPMENT TO MEET SPECIFIED REQUIREMENTS.

This precision, perfectly balanced machine features: rigid steel box structure-barrels of high strength ALCOA alloy — motor mounted below center of gravity — safe, positive drive — push button controls — carbide wire guides — interchangeable cradle assemblies — standard cradles taking 7" diam. X 4" Traverse Spools — 30 lengths of lay.



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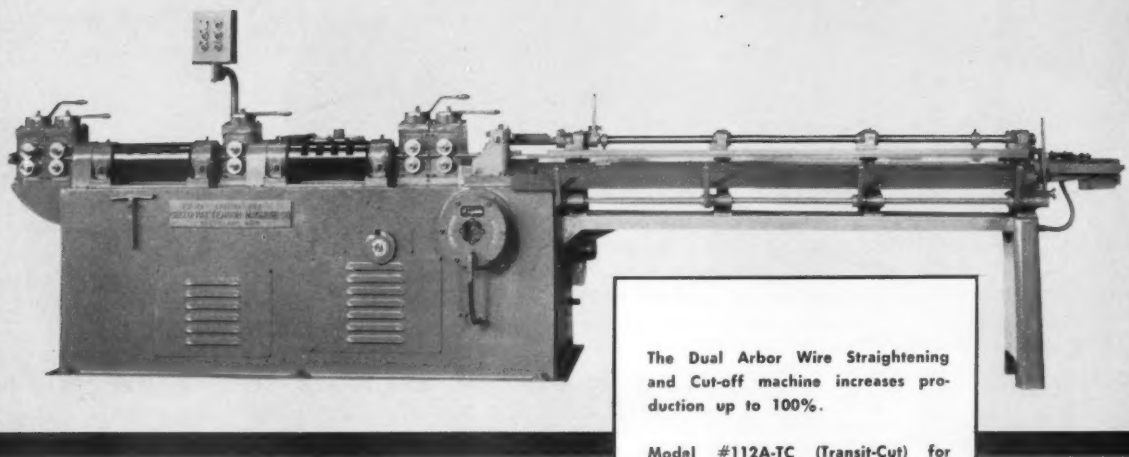
YACHT CLUB ROAD ROME, N. Y.

new from PATTERSON



The Dual Arbor Wire Straightening and Cut-off machine increases production up to 100%.

Model #112A-TC (Transit-Cut) for 6-ft lengths, shown

This machine is especially good news to the spring wire industry and other fabricators of Hi-Carbon Wire where forming is involved in subsequent operations.

Two straightening arbors revolving in opposite directions minimize the severe twist encountered from single arbor machines.

Ten driven feed rollers make possible the use of coils weighing up to 2,000 lbs., coupled with independent variable feed, independent fly-shear variable head speed, air clutch, air brake and solenoid clutch operator spells versatility and flexibility.

Call or write for complete information on this and other Transit-Cut, or fixed shear machines for straightening and cutting wire from .015" thru 1.00" diameter.

Twenty-five dependable dealers to serve you from coast to coast.

WRITE FOR FREE LITERATURE ON YOUR REQUIREMENTS

The GEO. C. PATTERSON Machine Company

3409 TRUMBULL ST. CLEVELAND 15, OHIO
PHONE: BRoadway 1-1808

in one single day
enough wire to run
50 private lines
to the moon

over 12 million miles of wire
are drawn through Indiana Wire Dies
in a single production day

WE SERVE THE ENTIRE WIRE DRAWING INDUSTRY

INDIANA WIRE DIE CO.
FORT WAYNE, INDIANA
ALABAMA WIRE DIE CO.
FAYETTE, ALABAMA

GRANODRAW SS Lubricant Base 300%, Cuts Heating Costs

Amchem Process Protects and Improves Surface Finish of Stainless Tubing

A 4000-gallon Granodraw SS operation is saving time and equipment, cutting costs and improving quality of stainless stock prior to drawing and reducing at Wallingford Steel—one of the world's largest producers of welded stainless steel tubing. In addition, Amchem Serseal chemical blanket has lowered heat costs, improved working conditions around the bath.

PRODUCTION TIME SAVED

Providing an excellent lubricant base, Granodraw SS has achieved an increase of 300 percent in drawing speeds at Wallingford's stainless tube reducing mill. Easily maintained and extremely stable, the Granodraw SS bath is left standing over a weekend, yet starts immediately in trouble-free operation for Monday morning operations!

VALUABLE EQUIPMENT PROTECTED

By preventing galling and seizing, and metal to metal contact between work and the dies, die life has been significantly increased. Drawing loads are between 20 and 25 percent less since use of Granodraw SS was instituted.

HEATING COSTS REDUCED

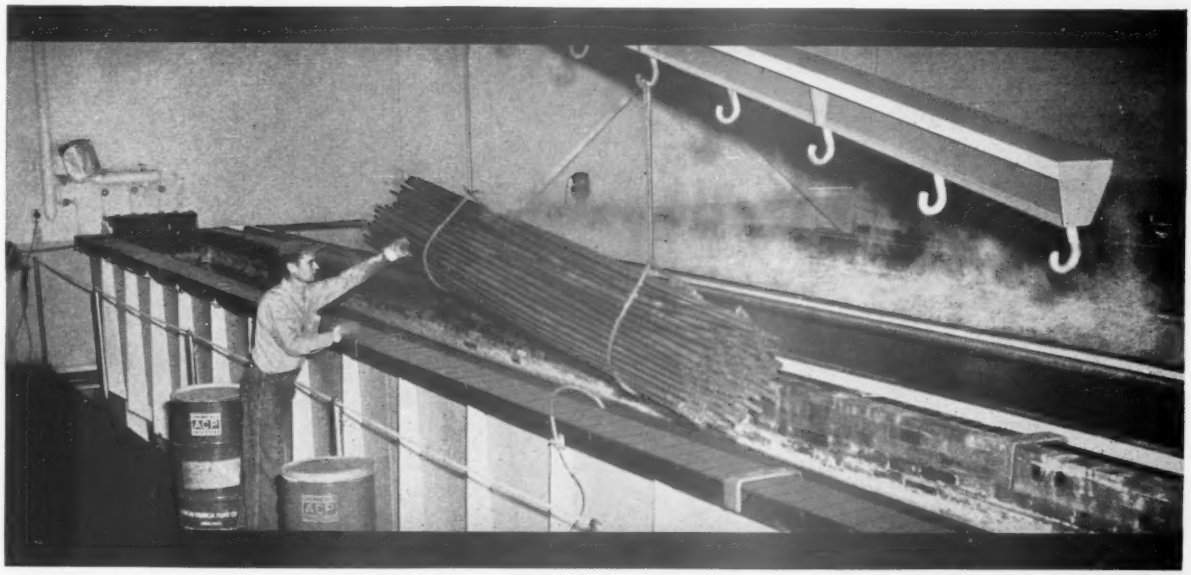
In conjunction with Granodraw SS, the Serseal chemical blanket for drawing operations has racked up additional savings in heat—up to 80 percent!—for Wallingford. With the bath effectively contained by Serseal, working hazards are reduced, corrosive effects are lessened on surrounding equipment—yet efficiency of the oxalate bath is not affected.

SURFACE FINISH IMPROVED

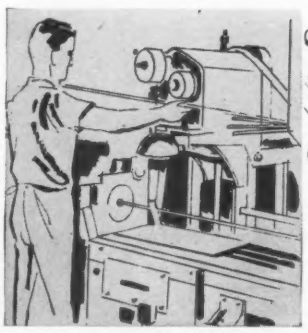
The Granodraw SS oxalate coating reacts with the metal surface, leaving a hard, spongelike deposit to which lubricants readily cling. As the stainless passes through the die, the lubricant melts and recrystallizes absolutely evenly —a sure sign of uniform, friction-free lubricating action and improved surface finish quality.

If your operations involve stainless tubes or wire drawing, cold heading or impact extrusion—find out how Granodraw SS can save you time, equipment and money while boosting product quality!

Increases Drawing Speeds and Rejects at Wallingford Steel!

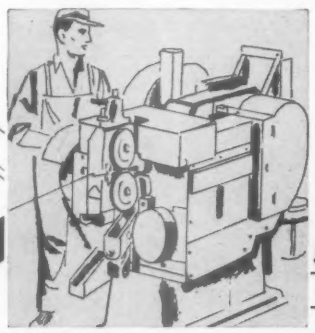


Stainless tubing prior to immersion in Granodraw SS bath at Wallingford Steel. Note absence of steam vapors and fumes, overall cleanliness of operation obtained by use of Amchem Serseal, new heat-reducing chemical blanket.

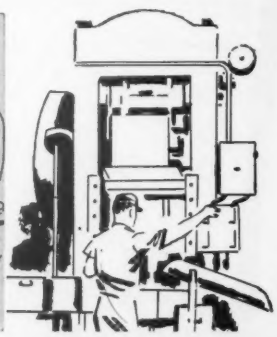


TUBE DRAWING

WIRE DRAWING



COLD HEADING



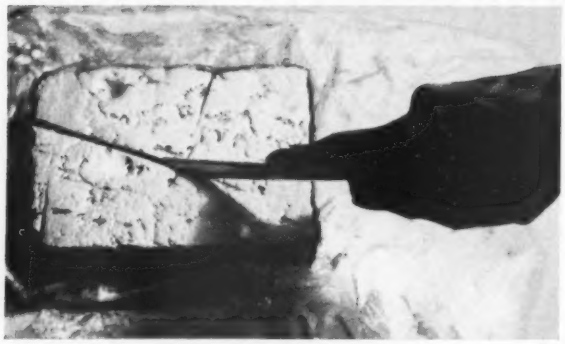
IMPACT EXTRUSION

Write for your copy of Bulletin 1437 on Granodraw processes, and further information on Serseal—two of the many Amchem chemicals for the metalworking industry.

AMCHEM GRANODRAW SS

Amchem, Granodraw and Serseal are registered trademarks of
AMCHEM PRODUCTS, INC. (Formerly American Chemical Paint Co.)
AMBLER, PA. • Detroit, Mich. • St. Joseph, Mo. • Niles, Calif.

Now-a Kenmix DISPERSION at a price you can afford to pay!



This stiff paste consists of 80 parts of sulfur and 20 parts of KENFLEX N.

These hard granules consist of 80 parts of sulfur and 20 parts of KENFLEX A.

TABLE IX

EFFECT OF FILLERS ON ELECTRICAL PROPERTIES OF LP-2 COMPOUNDS

(Base Formula: "Thiokol" LP-2, 100; Filler, variable; C-5, 15.)

Filler		Shore A Hardness[a]	Volume Resistivity ohm-cm	Surface Resistivity ohms	Dielectric Constant at 1 Kc	Dissipation Factor at 1 Kc
Type	Parts					
Properties of Sheets at 25°C and 50% R.H. (After 24 hr. Cure at 80°F and 10' Press-Out at 287°F)						
None	—	30	2.4×10^{11}	3.1×10^{15}	6.9	0.002
SRF Black	30	45	4.6×10^{10}	2.1×10^{14}	26.2	0.07
MT Black	30	35	3.2×10^{11}	1.4×10^{13}	13.2	0.008
Lithopone	50	42	8.6×10^{11}	1.6×10^{13}	7.6	0.001
Zinc Sulfide	40	35	3.1×10^{11}	6×10^{13}	7.8	0.003
Cab-O-Sil	15	44	2.27×10^{12}	1.7×10^{13}	7.3	.001
Burgess Pigment #20	25	33	7.03×10^{11}	1.7×10^{13}	7.9	.010
Burgess Pigment #20	50	52	1.0×10^{12}	2.1×10^{13}	8.1	.015
York Whiting[b]	50	40	3.0×10^{11}	6×10^{12}	7.4	0.004

[a]Determined on cup cures after 24 hr. at 80°F.
[b]Contains 5 parts of toluol in formulation.

Electrical Properties

Unfilled "Thiokol" LP-2 has moderate electrical properties which can be improved through the use of fillers, through tighter cures or through the inclusion of certain additives.

The effect of various fillers on the electrical properties of "Thiokol" LP-2 are shown in Table IX. Non-black fillers such as lithopone, Cab-O-Sil, zinc sulfide, York Whiting and Burgess Pigment #20 in loadings of 15 to 50 parts result in improved electrical properties. Of these, Cab-O-Sil, a fine silica pigment, yields the best over-all improvement in electrical properties.

Tighter cures also seem to have considerable bearing on the electrical properties. Use of 0.1 to 0.5 part of sulfur to attain higher states of cure, as indicated in Table X, results in a slight improvement in the resistivity.

The use of 15 parts of Kenflex A, a polymeric plasticizer, has a beneficial effect on the electrical properties as indicated by the following data:

Electrical Properties with Kenflex A

LP-2	100	100
Lithopone	50	50
Kenflex A	—	15
C-5	15	15
Shore A hardness after 24 hr.	35	30
Properties of Sheets After 24 hr. Cure at 80°F and 10 min. Press-Out at 287°F		
Volume resistivity, ohm-cm.	4.1×10^{11}	1.2×10^{13}
Surface resistivity, ohm.	1×10^{13}	1.6×10^{13}
Dielectric constant at 1 Kc.	8.1	6.9
Dissipation factor at 1 Kc.	0.002	0.0011

It should be noted that this compound exhibits a slight tendency to bleed, but the weight loss after a considerable period of time stabilizes in the neighborhood of 0.2%.

Dispersions of powdered rubber chemicals have gained rapidly in acceptance and efficiency but until now the difficulties of combining accelerator with suitable vehicles have resulted in costs higher than most compounds can bear.

Now, KENRICH PETROCHEMICALS pioneer in the field of dispersions, has perfected a method of combining accelerator with KENFLEX Resins and process oils that not only results in a better product than earlier combinations, but is far less expensive as well. The new KENFLEX dispersions can be a combination of from 80 to 90 parts of accelerator with KENFLEX A, L or N, or any process oil of your choice. The dispersion can be in granular, block or stiff paste form.

Write or phone today for information. We will be glad to quote prices for your combination of sulfur and vehicle.

KENFLEX® RESINS ARE UNIQUE IN IMPROVING ELECTRICAL PROPERTIES.

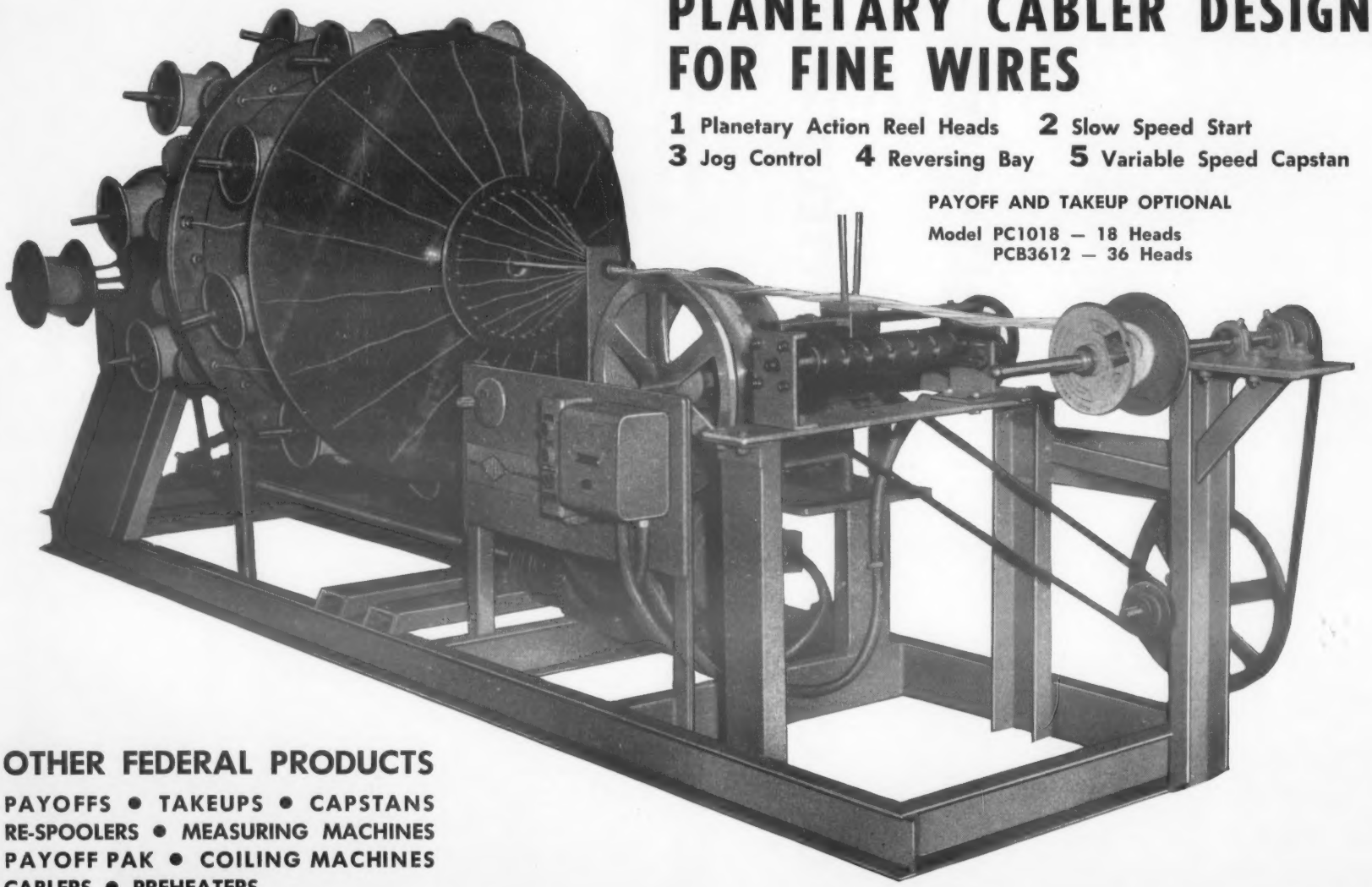
KENRICH PETROCHEMICALS, INC.
57-02 48th STREET, MASPETH 78, NEW YORK

PLANETARY CABLER DESIGNED FOR FINE WIRES

1 Planetary Action Reel Heads **2** Slow Speed Start
3 Jog Control **4** Reversing Bay **5** Variable Speed Capstan

PAYOFF AND TAKEUP OPTIONAL

Model PC1018 — 18 Heads
PCB3612 — 36 Heads



OTHER FEDERAL PRODUCTS

PAYOFFS • TAKEUPS • CAPSTANS
RE-SPOOLERS • MEASURING MACHINES
PAYOFF PAK • COILING MACHINES
CABLERS • PREHEATERS

Test Equipment
DIELECTRIC • HIGH POTENTIAL
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THE FEDERAL MANUFACTURING CO. WALLINGFORD, CONN.
WIRE MACHINERY • TESTING EQUIPMENT

NEBUTT CO

MACHINERY

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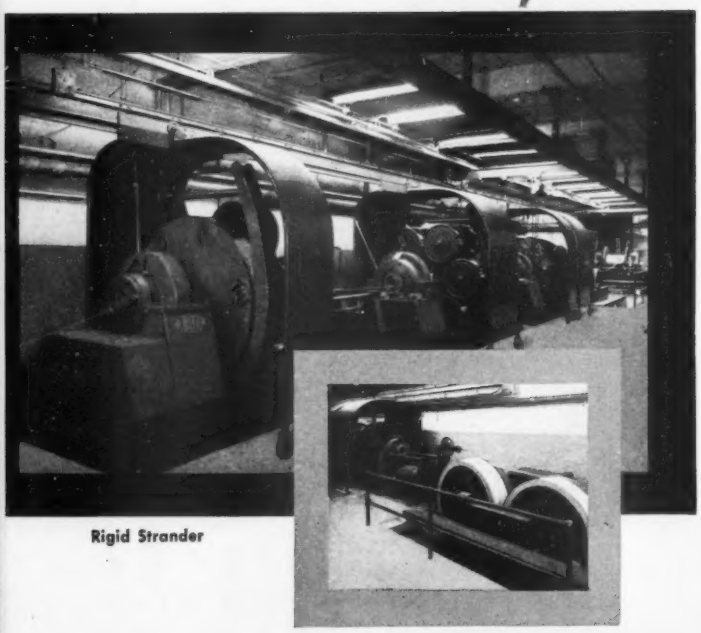
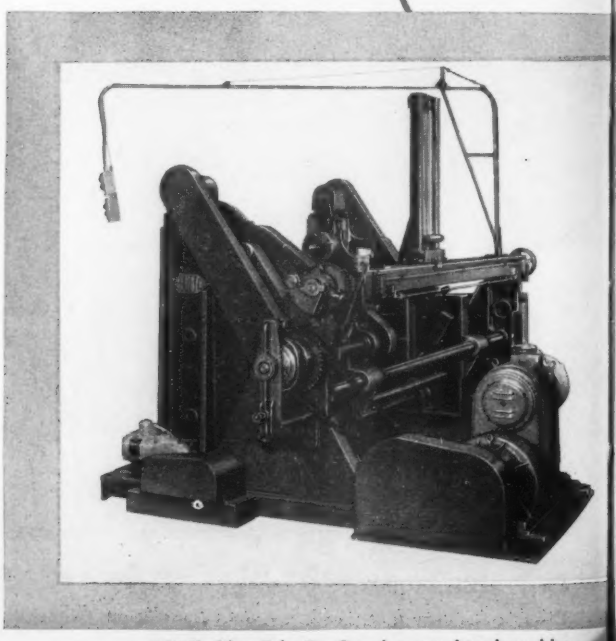
of cables, strands and ir

Fast and reliable, New England Butt Co. Equipment has that *something extra* for the profitable production of cables or strands, bare or insulated. Ask for information and literature.

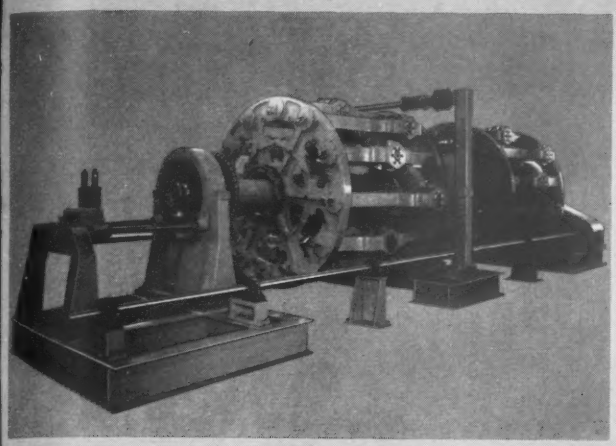


Rigid Strander

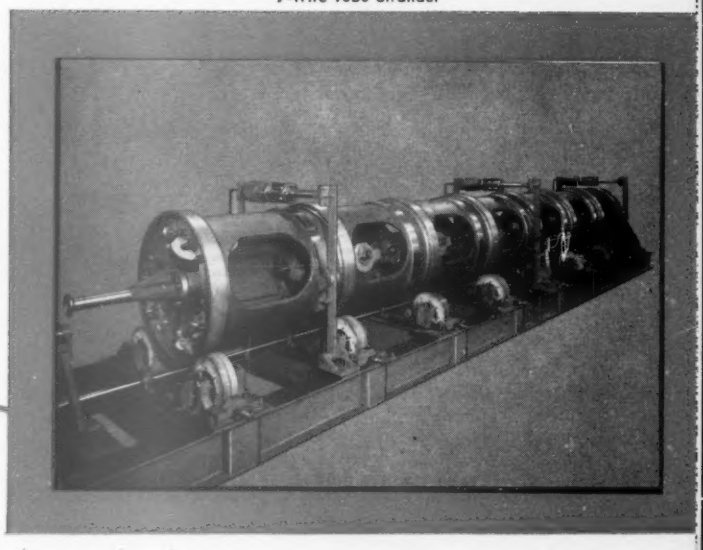


96" Shaftless Take-Up. Guard removed to show drive

24-Strand Planetary Cabler — 22" dia. Reels



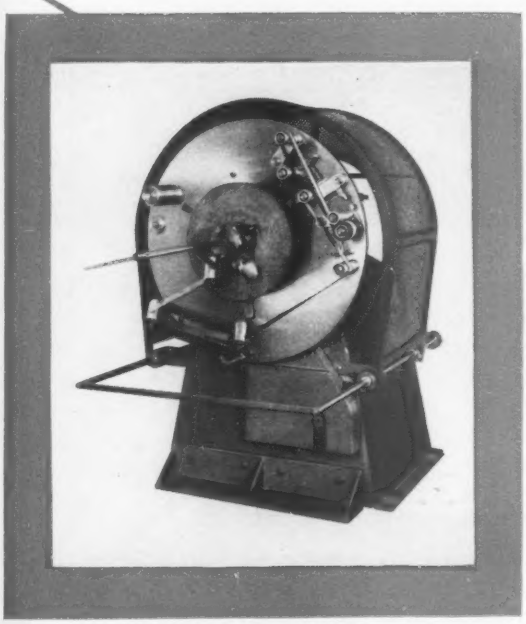
7-Wire Tube Strander



d production

d insulation

Eccentric Taping Head



Concentric Taping Head

New England Butt Co.

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304 Pearl Street · Providence 7, R. I.

In **ENGLAND** — James Day (Machinery) Ltd., 28 Maddox Street, London, W-1.

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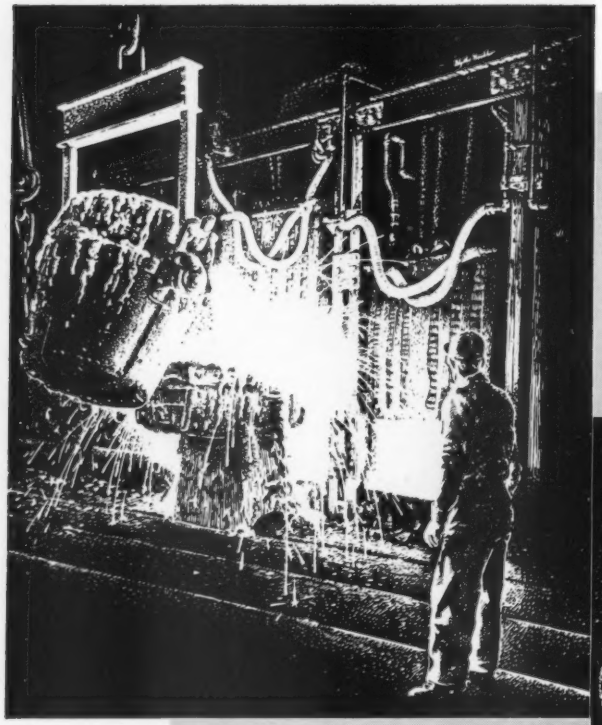
TAPING MACHINES



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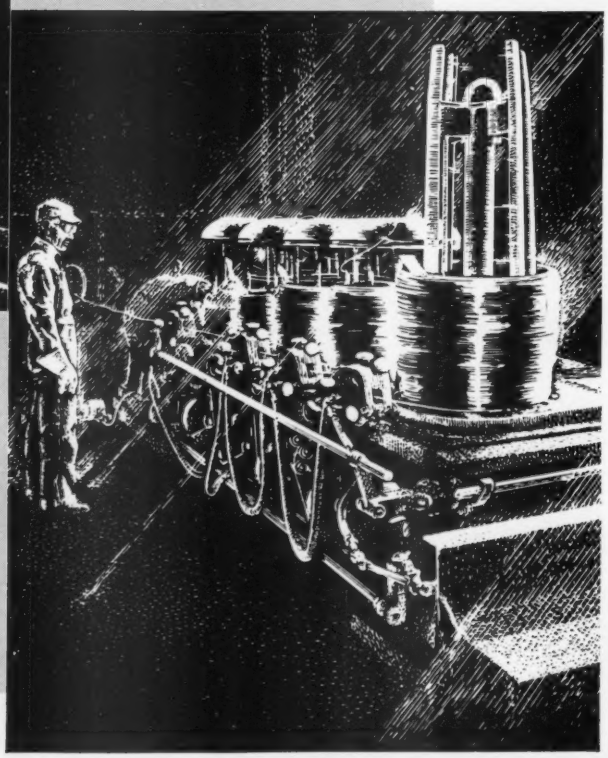


Quality Wire... for every need!

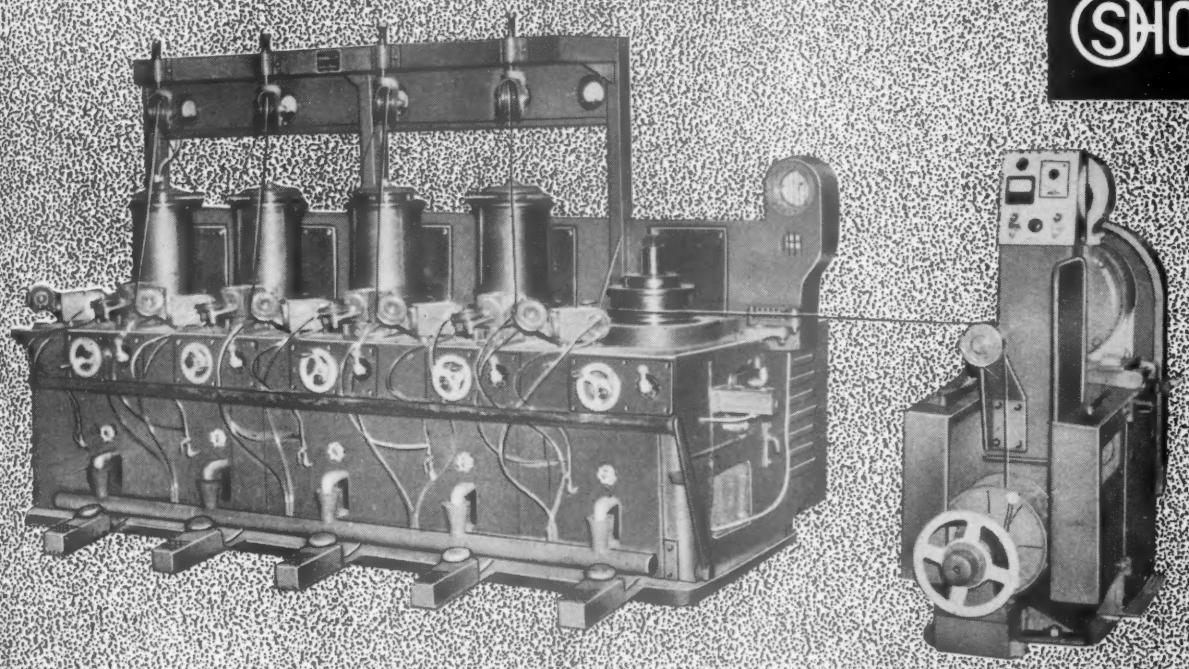
A COMPLETE SELECTION — QUALITY CONTROLLED FROM OPEN HEARTH TO DELIVERED PRODUCT

From low carbon wire through medium high carbon wire, MB Grade spring wire, HB Grade spring wire, in all sizes, finishes and tempers.

Laclede specializes in metallurgical service that can quickly be of benefit to you and your product.

LACLEDE STEEL COMPANY

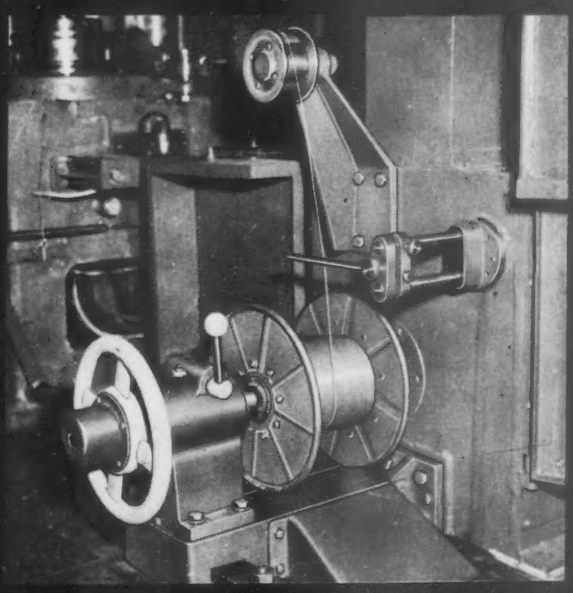
SAINT LOUIS, MISSOURI



MODEL CD-300-11M

Continuous Wire Drawing Machine

for High & Low Carbon Steel Wire

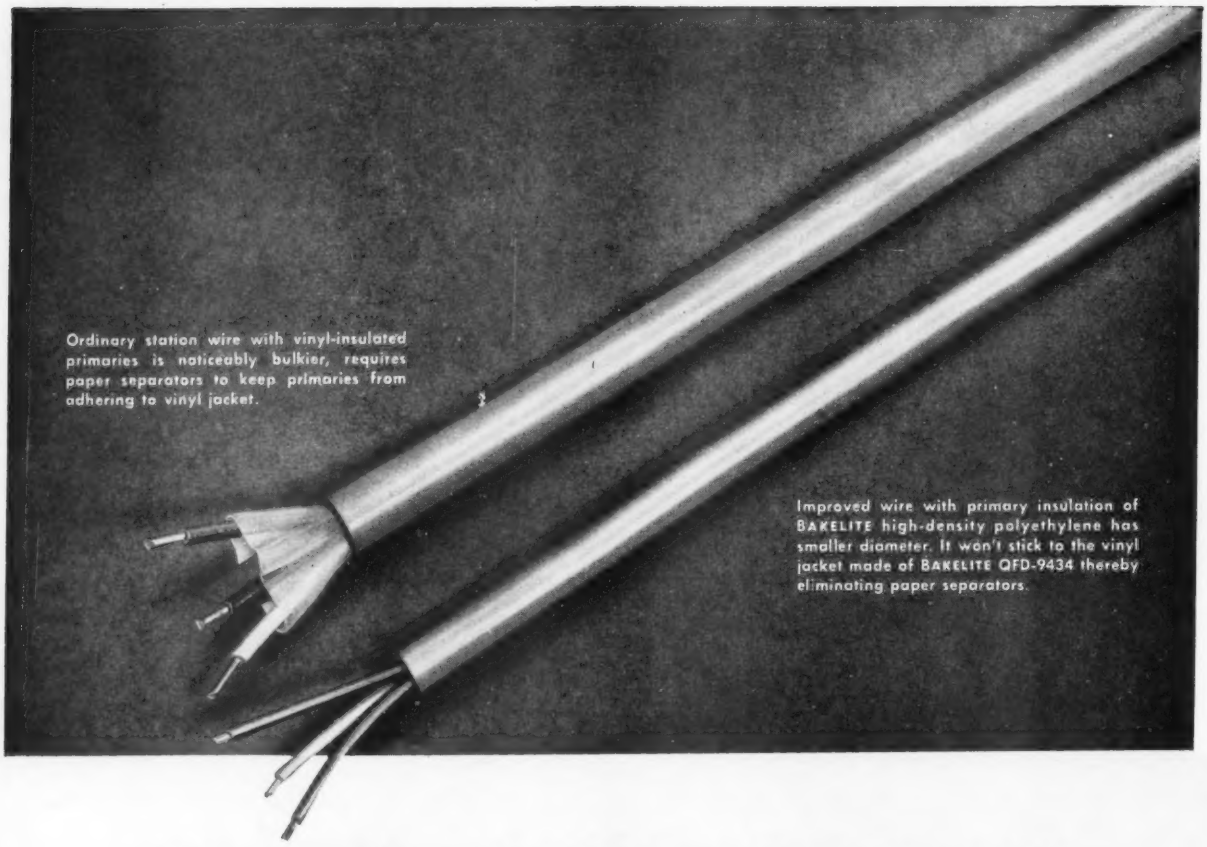


SPECIFICATION

	Mild steel	High carbon steel
Max. entry diam.	3.2m/m	2.6m/m
Finished wire	1.4m/m–0.5m/m	0.9m/m–0.4m/m
Finishing speed	210–750m/min. (infinity variable)	
Block diam.	NO. 1 / NO. 2 to NO. 5 / NO. 6	
	300m/m / 250m/m	250m/m / 210m/m	250m/m or 300m/m
Number of Hole	11	
Motor	each 7.5HP A.C. Motor	
Spooler		
spool size	up to 400m/m	
spool capacity	up to 100Kg	
spool motor	2KgM Torque motor	

SHOWA MACHINE WORKS LTD.

No.16, Naka 3-chome, Mitezima, Nishi-Yodogawaku, OSAKA, JAPAN.


Ordinary station wire with vinyl-insulated primaries is noticeably bulkier, requires paper separators to keep primaries from adhering to vinyl jacket.
Improved wire with primary insulation of BAKELITE high-density polyethylene has smaller diameter. It won't stick to the vinyl jacket made of BAKELITE QFD-9434 thereby eliminating paper separators.

LOOK AT HOW HIGH-DENSITY POLYETHYLENE REDUCED THE SIZE OF STATION WIRE!

...thinner walls bring new benefits

When Alphaduct Wire and Cable Corporation switched to insulating station wire primaries with BAKELITE high-density polyethylene DGD-4100, smaller, neater looking constructions were made possible . . . at lower costs.

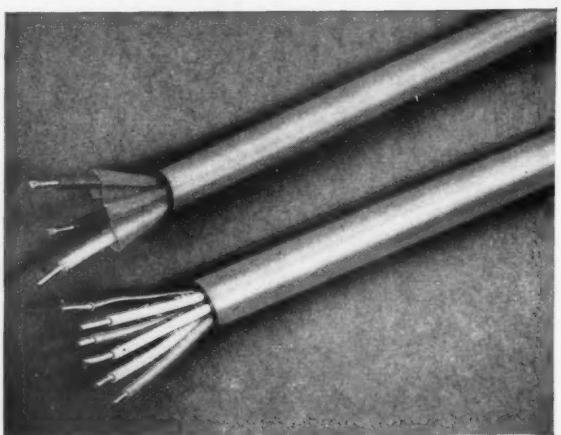
Thinner walls of insulation provided by the exceptional toughness of BAKELITE high-density polyethylene have brought impressive benefits to fabricator and user:

Station wire is now less bulky, has lighter weight and smaller diameter; exposed installations won't look untidy.

Paired station wire, available for the first time in two, three and four pairs, can be made the size of previous station wire.

The toughness of BAKELITE high-density polyethylene even makes stripping of the jacket easier—any of the insulated primaries can be used to rip cleanly through the vinyl jacket.

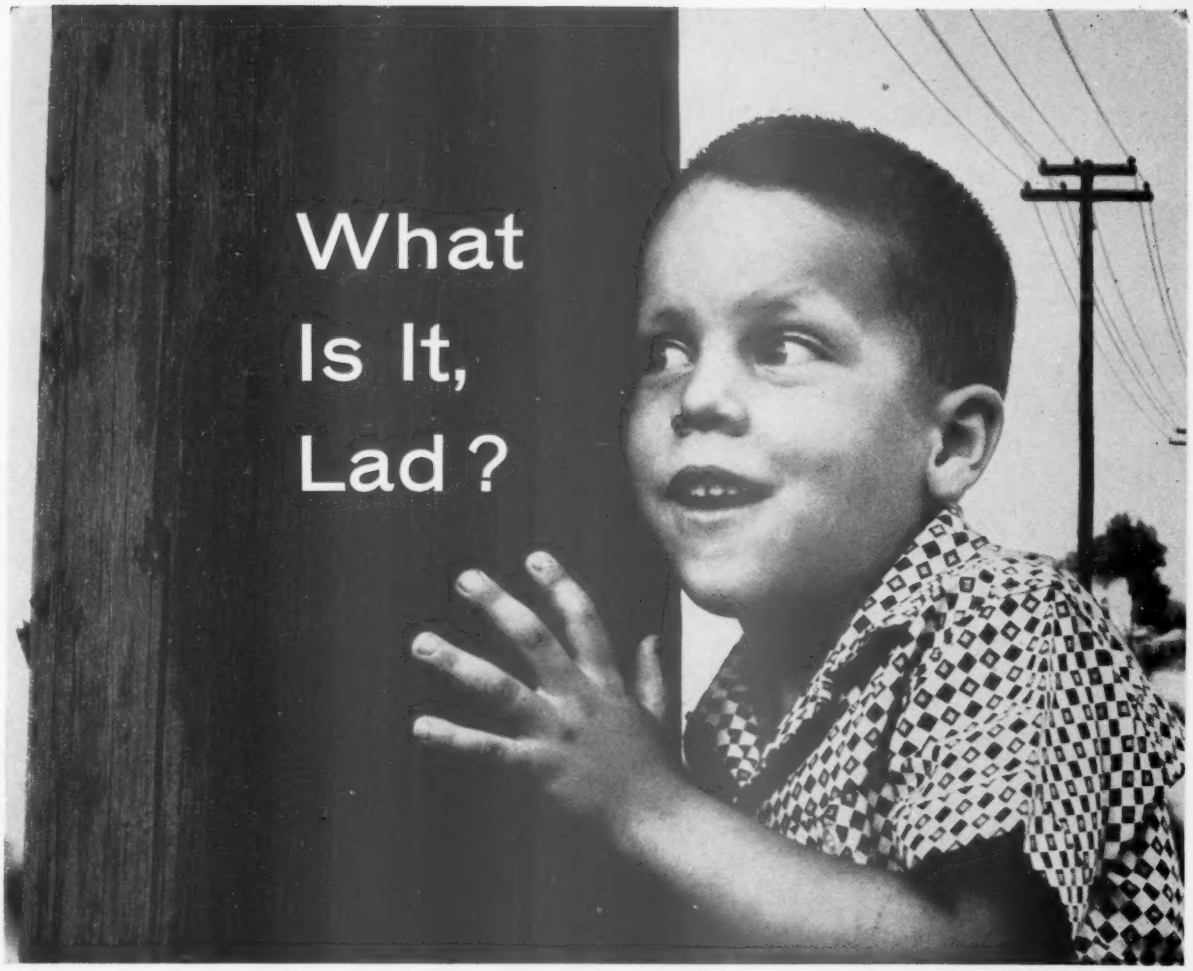
By insulating primaries with BAKELITE high-density polyethylene, you can expect superior electrical and physical properties leading to maximum service life, smaller space requirements and substantial savings in material costs. For more information on how this material can improve your product, write Dept. ED-160, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada,* Union Carbide Canada Limited, Toronto 12.



New three-pair station wire is slightly larger than old construction with fewer primaries ... thanks to thinner wall insulation.

UNION CARBIDE

"Bakelite" and "Union Carbide" are registered trade marks of Union Carbide Corporation.



Westwinds Blowing Through Southwire

Every inquisitive boy has had his curiosity aroused by the hum of wind through wire. Today throughout the nation—west, north, east and south—when a boy places his ear to a utility pole, chances are he'll hear wind blowing through Southwire. Mile after mile of Southwire spans the nation—in high voltage electrical transmission lines, primary and secondary electrical distribution systems and telephone systems. Southwire began as a regional manufacturer just ten years ago. Today we have customers in 44 states and many foreign countries. Thanks to you and our other customers, Southwire has enjoyed a steady growth. We will strive to continue to merit your confidence in the years ahead.

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- Telephone Cable
- Machine Tool Wire

• ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

Southwire Company

Carrollton, Georgia — TErrace 2-6311

SOUTHWIRE serves the world

D. C. Forry, sales manager for Ridge Door, left, shows Pittsburgh Steel Salesman Robert Hogan how each spring is tagged, indicating pounds pull to assure that the proper weight garage door is matched with the proper springs.

Testing a 25-inch long extension spring to determine the pounds pull required to extend the spring to 67 inches. Engineering formulas tell workers what weight springs will balance each door. Correct pounds pull is marked on tag which is fastened to spring

How Pittsburgh Steel's Wire Helps A Door Man Keep His Balance

Ridge Door Company Uses Oil Tempered Spring Wire From Pittsburgh Steel Company To Coil Extension And Torsion Springs Which Balance Garage And Industrial Doors Within Five Pounds

It takes an even temper to make a garage door.

For Ridge Door Company of Monmouth Junction, N.J., "even temper" means dependable uniformity in oil-tempered spring wire it gets from Pittsburgh Steel Company.

Garage doors are deceiving. Doors identical in style and size can vary as much as 30 pounds in weight due to the wood's moisture content and other factors. Yet the springs which open and lower doors with mere finger-tip pressure must be in near perfect balance.

Uniformity of Pittsburgh Steel's oil-tempered spring wire enables Ridge Door, a division of Muskegon Motor Specialties Company, to match individual doors to springs whose pull is within five pounds of the door's weight. Here's that story:

The matching process begins with completion of the wooden door, made of high altitude, kiln-dried hemlock or Douglas fir. Each finished door is weighed carefully and tagged to show its weight.

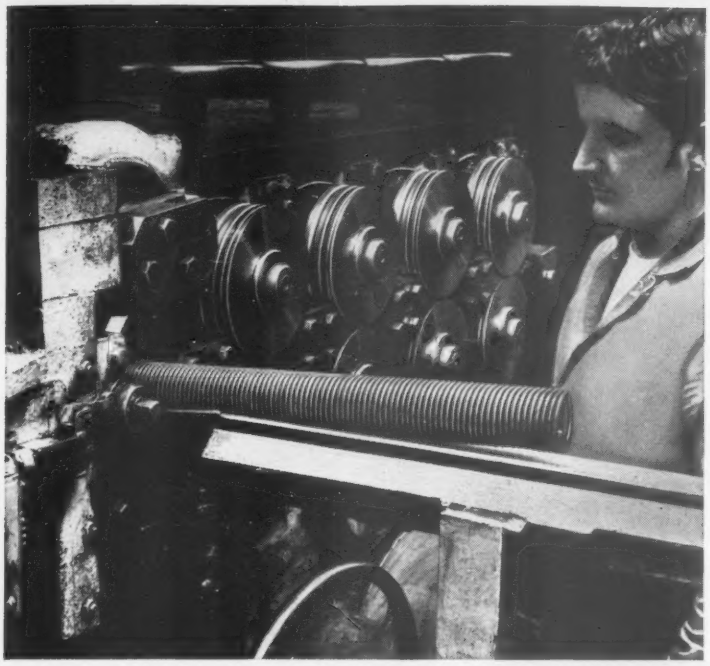
Meanwhile in the Spring Department springs are being coiled according to engineering formulas which take into account door weights, drum diameters and other factors. After coiling, each extension spring is tested to determine the number of pounds pull required by extending it a specified number of inches. This pull is machine stamped on a tag which is fastened to the tested spring.

For example, a 25-inch spring is extended to 67 inches and the pounds pull is automatically recorded.

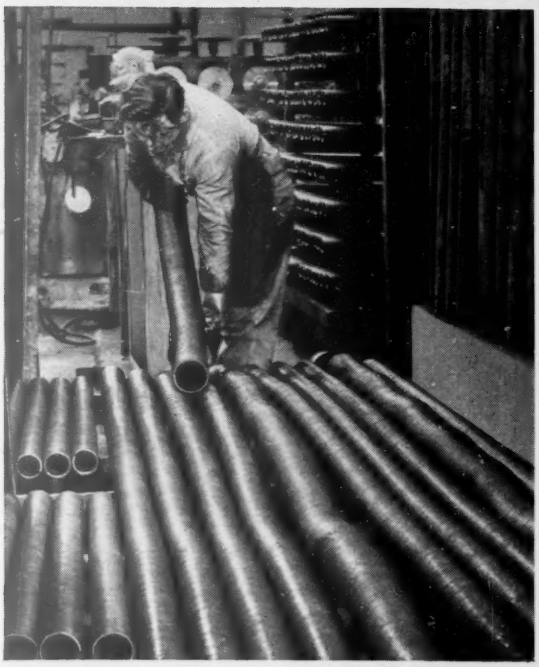
Engineering formulas tell the workers what weight springs to match with different doors. As a result, Ridge Door is able to assure its customers that doors will be in balance within five pounds.

Uniformity of oil tempered spring wire makes this precision work possible. Springs coiled from Pittsburgh Steel wire can be depended on for consistent performance.

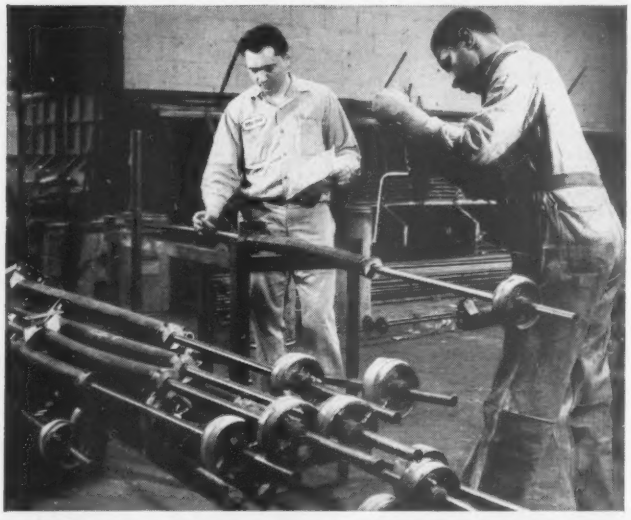
Coiling up to five tons of springs a day provides a tough test which



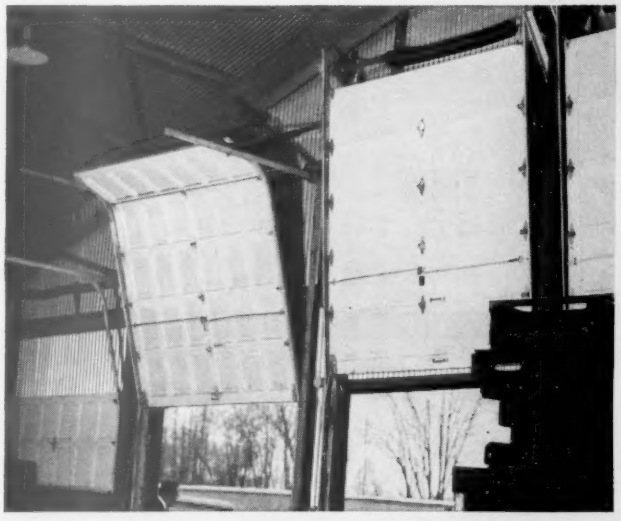
Uniform diameters and freedom from hard and soft spots speed spring coiling in the Monmouth Junction, N.J., plant of the Ridge Door Co. Division of Muskegon Motor Specialties Co. Pittsburgh Steel Co.'s oil tempered spring wire helps Ridge Door match springs to doors so precisely that finished product is in near perfect balance.



After coiling, springs are loaded into a two-unit, gas-fired furnace for heat treating. Springs are stress relieved for an average of 45 minutes at 475 degrees F. to achieve desired physical characteristics.



Assembling torsion springs on shaft. Each of these shafts will get two springs for use in raising a 16 by 7-foot double garage door. The springs shown here are coiled from wire .263 inch in diameter. The finished springs each have 120 coils. Drums and cables already are assembled.



A combination of high lift and vertical lift industrial doors produced with springs coiled from Pittsburgh Steel Co. wire is shown here. The installation is in the New Brunswick, N. J., warehouse of the Herman Forwarding Co.

Pittsburgh Steel wire passes.

Carmen Pellino, foreman of the Spring Department, puts it this way:

"We must have wire with uniform diameters, free from kinks as well as hard and soft spots.

"Variations in diameter prevent proper coiling since the wire will not pass through the rolls on the coiling machines properly. Soft and hard spots produce uneven coils and affect spring performance. We have found springs coiled from Pittsburgh Steel wire coil without trouble and perform well in service."

Other users of the wide range of wires for industry produced by Pittsburgh Steel get similar advantages. For improved production and greater customer satisfaction, call one of the district offices listed below. Real help is as close as your phone.

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

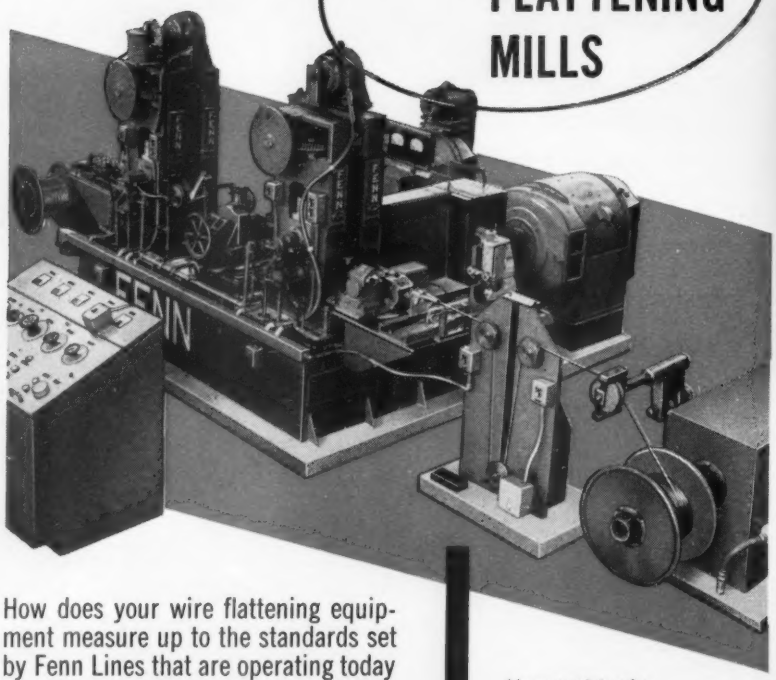
DISTRICT SALES OFFICES

Atlanta	Cleveland	Detroit	Los Angeles	Pittsburgh
Chicago	Dayton	Houston	New York	Tulsa
			Philadelphia	Warren, Ohio

Steel

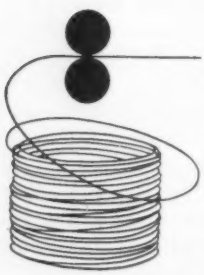
FENN *Sets the Pace*

with precision ferrous **WIRE FLATTENING MILLS**



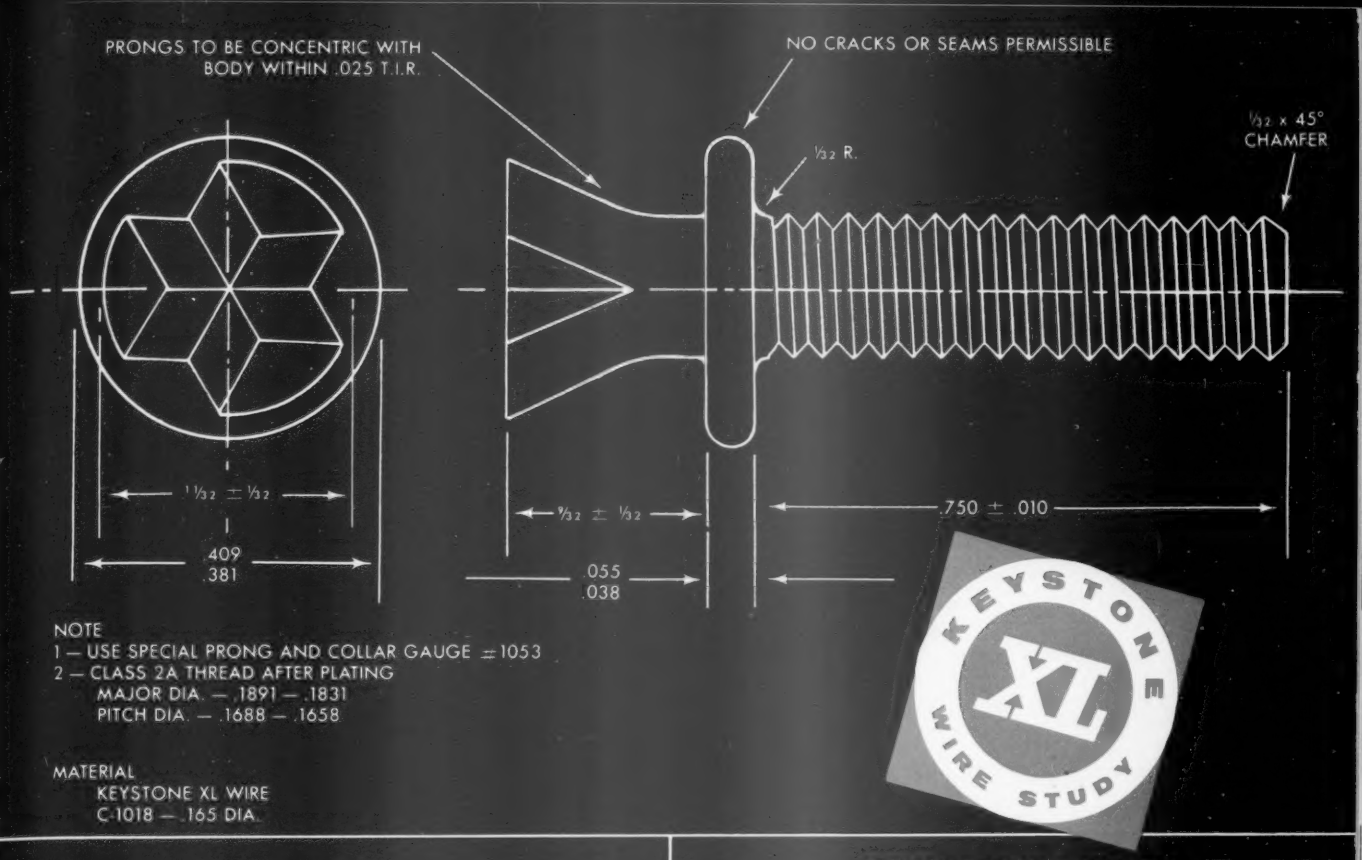
You are cordially invited to visit the Fenn Hospitality Suite La Salle Hotel during the Wire Convention . . .

How does your wire flattening equipment measure up to the standards set by Fenn Lines that are operating today in the plants of both ferrous and nonferrous producers? Advanced engineering features, greater versatility, and higher operating speeds, provide users with important competitive advantages. For example, this Two-Stand Tandem Fenn Line exemplifies the finest precision ferrous wire flattening equipment. It is helping one of the nation's largest wire producers to deli er high carbon flats and rectangles to critical tolerances at production speeds up to 1500 fpm. Fenn engineers welcome the opportunity to design and build equipment to your exact production and competitive requirements.



Line consists of a motorized pay-off, a Model 082 Two-Stand Tandem 8" Roller Bearing Rolling Mill with DC variable speed drive, and a hydraulic traversing take-up reel. Features of the mill include: carbide shell rolls (8" diameter x 2" face), electric powered screwdowns, internal and external coolant system, automatic lubrication, friction driven edger, and continuous width and thickness gauges. Tension and speed synchronization are regulated by dancer roll control.

FENN MANUFACTURING COMPANY, NEWINGTON, CONN.



NOTE
1 — USE SPECIAL PRONG AND COLLAR GAUGE ±1053
2 — CLASS 2A THREAD AFTER PLATING
MAJOR DIA. — .1891 — .1831
PITCH DIA. — .1688 — .1658

MATERIAL
KEYSTONE XL WIRE
C-1018 — .165 DIA.

10-32 x 3/4
TERMINAL BLOCK STUD

PIONEER SCREW & NUT CO.
MELROSE PARK, ILLINOIS

DIFFICULT — BUT SOLVED
BY PIONEER SCREW & NUT CO.
with KEYSTONE XL WIRE

Faced with a difficult heading problem, Pioneer Screw & Nut Co., Melrose Park, Illinois, uses Keystone XL .165" Cold Heading Wire to upset, in a double blow, the terminal block stud illustrated here. This stud with its three prongs embedded into a plastic strip becomes an electrical terminal stud for such major heavy appliances as stoves, refrigerators, dryers, washers.

Specials from Pioneer Screw & Nut Co. require Keystone XL Wire when flowability for extreme shapes is required, such as this terminal block stud.

Says Robert A. Hirsch, President, "Pioneer's consistent high torque and quality requirements for our special screws are the reasons why we specify Keystone Wire. The end products result in better screws supplied to our customers."

Should you have wire forming problems, send us your blue prints and specifications. Our metallurgists will be pleased to analyze your wire requirements. Or call your nearest Keystone Wire Specialist; he is highly qualified to help you.

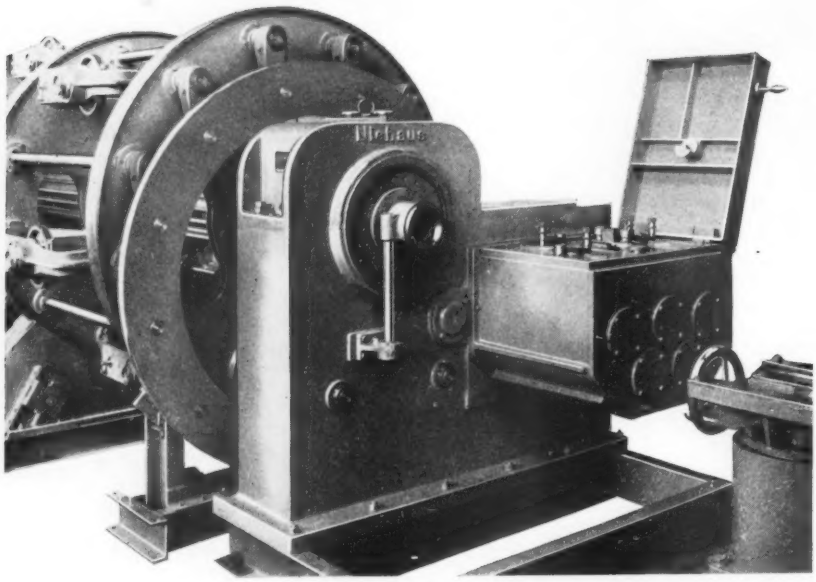
Keystone Steel & Wire Company, Peoria, Illinois

KEYSTONE
WIRE FOR INDUSTRY

NIEHAUS

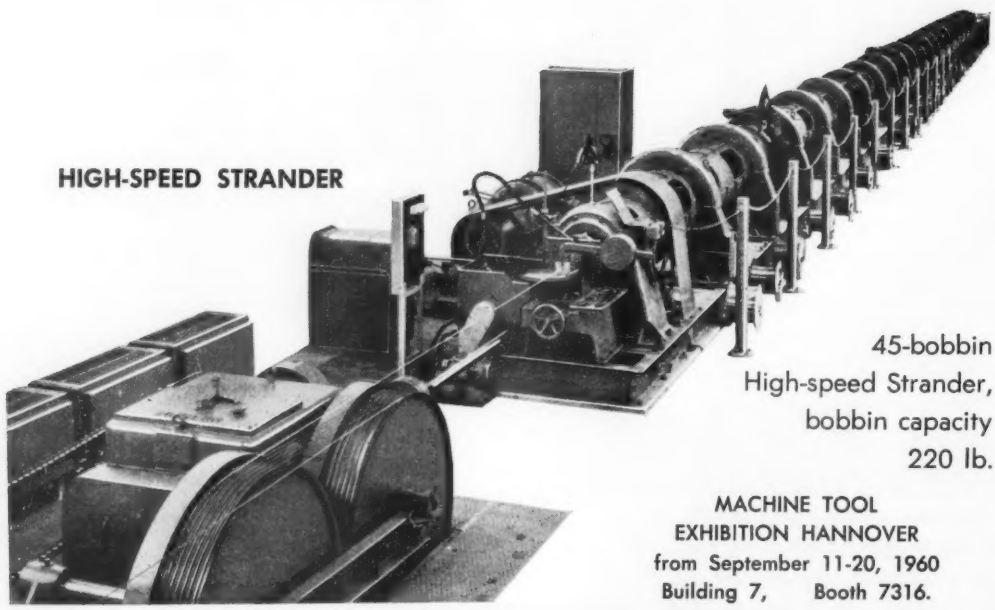
ELECTRIC-CABLE MACHINERY • WIRE-ROPE MACHINERY

PLANETARY STRANDER



We manufacture: Stranding and Rope-closing Machines of tubular and planetary design, of any size and for any number of bobbins, as well as the pertinent auxiliary machinery and equipment.

HIGH-SPEED STRANDER

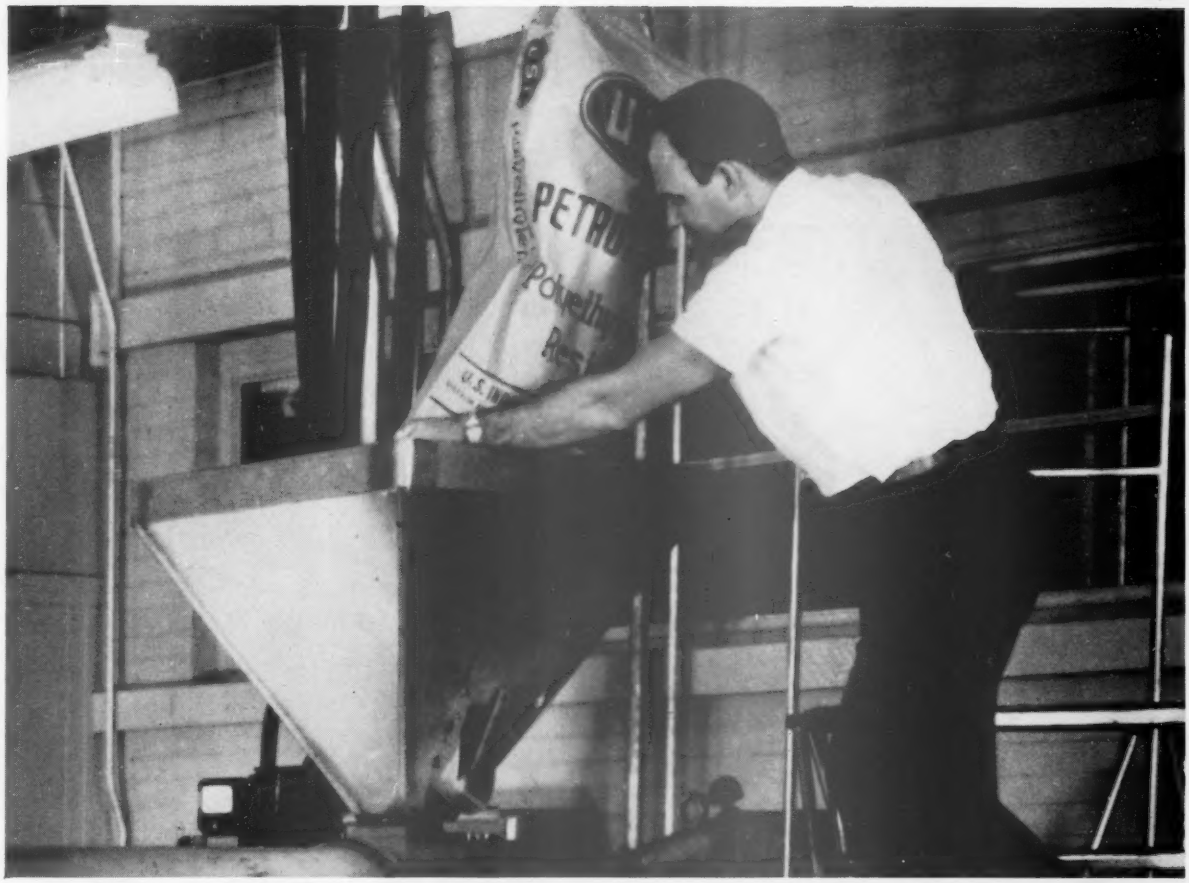


45-bobbin High-speed Strander, bobbin capacity 220 lb.

MACHINE TOOL EXHIBITION HANNOVER
from September 11-20, 1960
Building 7, Booth 7316.

MASCHINENFABRIK K. A. NIEHAUS • DUSSELDORF-RATH

Sole Representative: Paul Reicher Machinery & Equipment, Ltd., 600 Eglinton Ave., East, Toronto 12, Ont., Canada



You charge the resin as received when you produce polyethylene-covered wire

because polyethylene needs no blending

Manufacturing polyethylene-covered line wire is simple. You feed the resin, as you receive it, to the extruder. There are no plasticizers, softeners, antioxidants to add. There's no prebatching, blending, milling; no vulcanizing after extrusion. Carbon black and antioxidants are already in the resin.

A complete polyethylene production program simplifies operations in other ways too. One production line can take the place of several, providing savings in equipment, floor space, maintenance and labor. Stocking only one material reduces purchasing and inventory problems.

With polyethylene, you base production on a material that has trended downward in price as capacity increased. And ample capacity for PETROTHENE® polyethylene insures continuous supplies of uniformly high-quality resin.

Look To Tomorrow's Sales

See how polyethylene can improve the profitability of your operations tomorrow, if not today. With other insulating costs trending upward, polyethylene can be expected to be your most profitable line wire coating in the years to come. You can prepare for those profits *by promoting polyethylene-covered line wire now*, just as U.S.I. is doing in a series of advertisements in utility magazines.

For your customers, polyethylene means a product that is easy to handle . . . has exceptional weather and stress-crack resistance . . . is long-lasting in service. This tough plastic covering is registering outstanding service records for power cable, communications cable, WD-1 infantry field wire, TV lead wire and many other applications.

U.S.I. PETROTHENE polyethylene resins are tailored to provide the proper balance of properties needed in different end uses. To help you choose the most suitable resin for each use, we've compiled a chart of the properties, applications and applicable specifications of PETROTHENE polyethylene compounds. This information is in a new four-page data sheet, "PETROTHENE Resins for the Wire and Cable Industry." Also available is U.S.I.'s comprehensive 100-page "PETROTHENE Polyethylene . . . A Processing Guide." Write for your copies.

U. S. Industrial Chemicals Co.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.

Please send me:

☐ "PETROTHENE Resins for the Wire and Cable Industry"
☐ "PETROTHENE Polyethylene . . . a Processing Guide"

Name_____

Title_____

Company_____

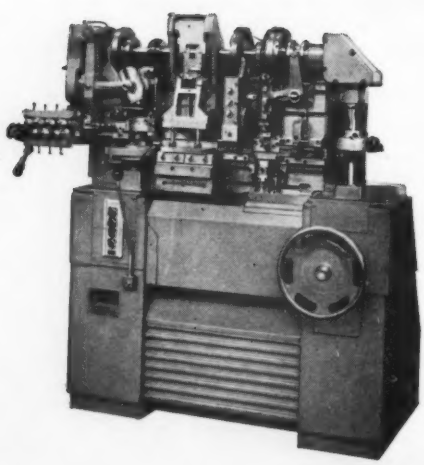
Address_____

City & State_____

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
Branches in principal cities

THESE PARTS ARE BEING PRODUCED AT SPEEDS OF 90 TO 250 PCS/MIN

PROFIT-TREE!



These are formed parts produced in single automatic operations on the revolutionary new Torrington Vertical 4-Slide.

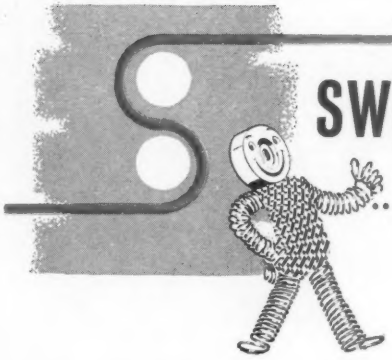
With precision and speed, the Verti-Slide has replaced as many as five and six progressively tooled presses in the production of a complex part. Normal secondary operations such as welding are being done in one continuous automatic operation in excess of 100 pcs/min.

If you make or buy complex wire or strip parts, the Verti-Slide method offers dramatic reductions in production cost. Less parts handling, in process inventory, machine space—all mean greater profits to you.

Write or call for field technical data or a Torrington Sales Engineer.

THE TORRINGTON MANUFACTURING COMPANY

MACHINE DIVISION Torrington, Connecticut



SWIFT'S ANTI-FRICTION ACTIVITIES

FREDDIE F. REPORTS ON:

FLEXIMET* MCF

METALLIC COMPLEX LUBRICANT

A versatile, high speed "light" film lubricant for a variety of metals

This homogeneous, fine-mesh, drawing compound promotes consistently efficient lubrication on today's high speed benches for either high or low carbon steel. It performs equally well in drawing aluminum, stainless and titanium alloys.

Fleximet MCF usually produces a dry, hard, light film finish, over lime, borax or phosphate precoatings.

Extremely versatile, Fleximet MCF may be used directly in the die box or cut with lime as desired.

WRITE FOR BULLETIN 25

Small mesh, vari-grind, free-flowing powder. Extremely low moisture.

TAKE ANTI-FRICTION ACTION with versatile FLEXIMET* products—developed to serve your industry better

For drawing heavy gauge . . .

FLEXIMET MCA

A high titer calcium stearate complex for high speed multiple-hole draw benches. *Write for Bulletin 24.*

For high heat stability . . .

FLEXIMET PCM

Fortified with extreme pressure additives to provide a protective, non-reactive coating which remains stable even after being subjected to stress relief heat treatment. *Write for Bulletin 46.*

For dry drawing or hot dip-dry film lubrication . . .

FLEXIMET S

Exceptionally rich 80% sodium stearate with rust inhibitor and bonding aid added. Outstanding lubrication with either phosphate or borax precoat. *Write for Bulletin 26.*

For cold heading . . .

FLEXIMET MCL

A lean lubricant. Especially formulated to provide protection and quick release—without excessive build-up on heading dies. *Write for Bulletin 44.*

For hard-to-work metals . . .

FLEXIMET M2DS

Compounded to help upgrade production rates on "tough jobs"—drawing mechanically descaled rod, high manganese steel, etc. Engineered for top lubrication and extended die life. Effective for multiple drafting at high speeds. *Write for Bulletin 45.*

Swift

105TH YEAR

*TRADEMARK OF SWIFT & COMPANY

SWIFT & COMPANY · SOAP DEPARTMENT

4115 Packers Ave., Chicago 9, Illinois

To Serve Your Industry Better

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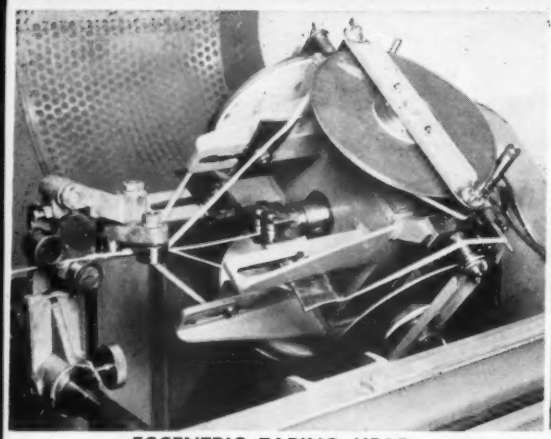
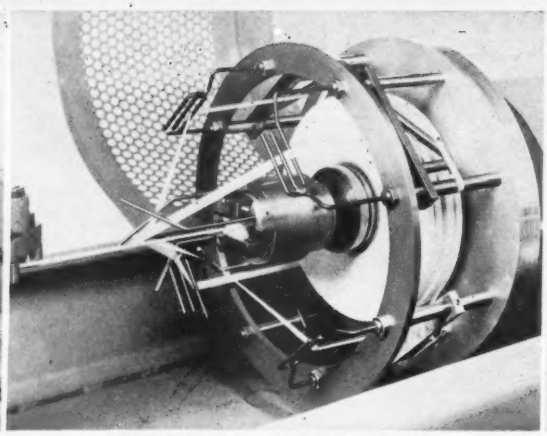
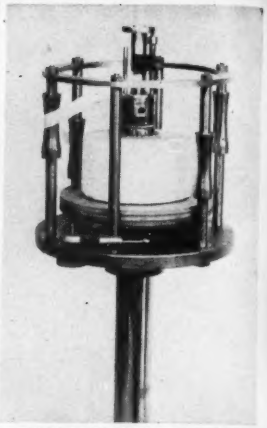


ECCENTRIC TAPING HEAD
NO. 889 (2, 3 & 4 TAPES)

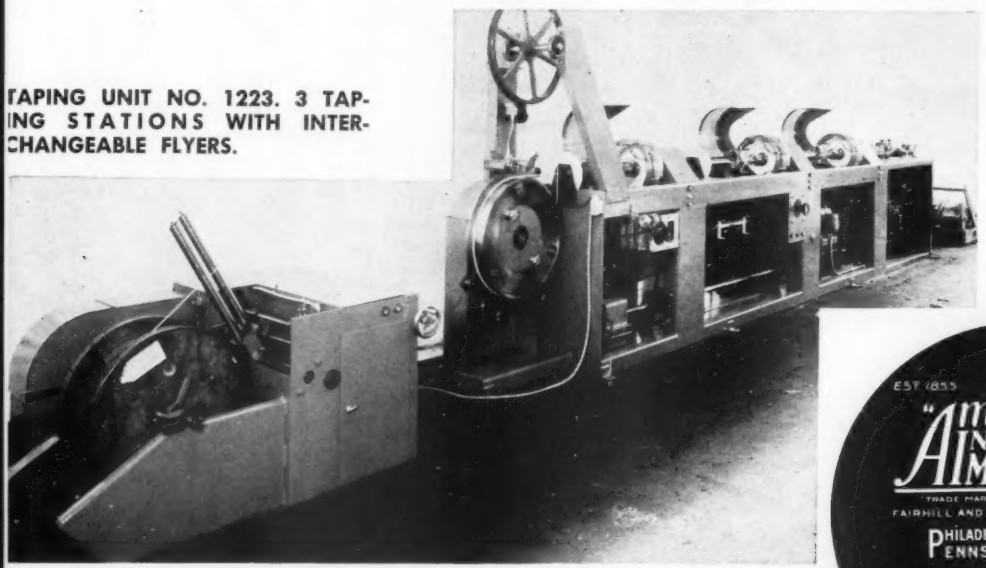


CONCENTRIC TAPING HEAD
NO. 1231 (1, 2, 3 or 4 TAPES)

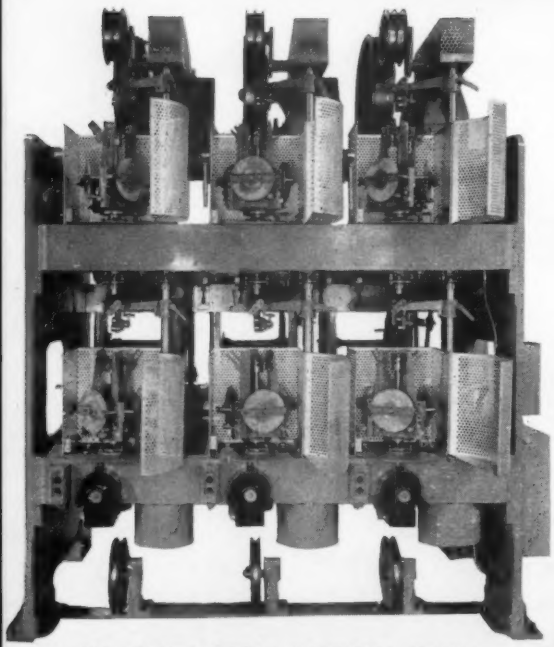


CONCENTRIC TAPING HEAD FOR UNIVERSAL WOUND COPS
No. 1147.

TAPING UNIT NO. 1223. 3 TAPING STATIONS WITH INTERCHANGEABLE FLYERS.

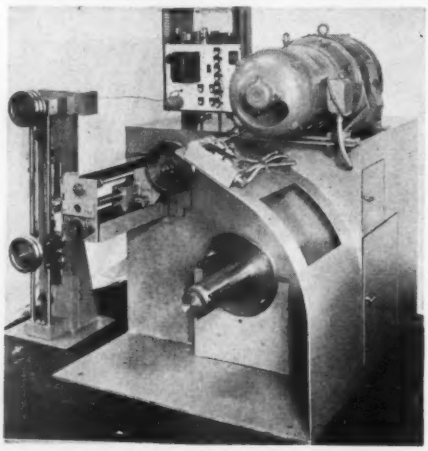


EST. 1855 AIMCO INC. 1915
"American"
AIM INSULATING MACHINERY COMPANY
TRADE MARK
FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33 PENNSYLVANIA U.S.A.
MANUFACTURERS OF WIRE INSULATING MACHINERY AND ALLIED EQUIPMENT. MACHINERY MFG. TO CUSTOMERS SPECIFICATIONS.

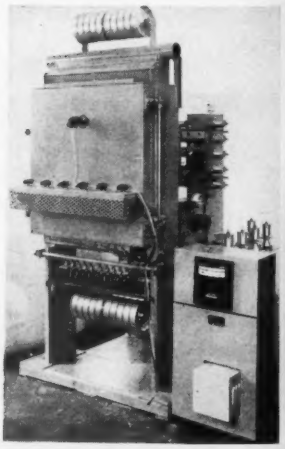


NO. 3-D-3 TAPING MACHINE, EACH TAKING 3 PAD ECCENTRIC TYPE FLYER.

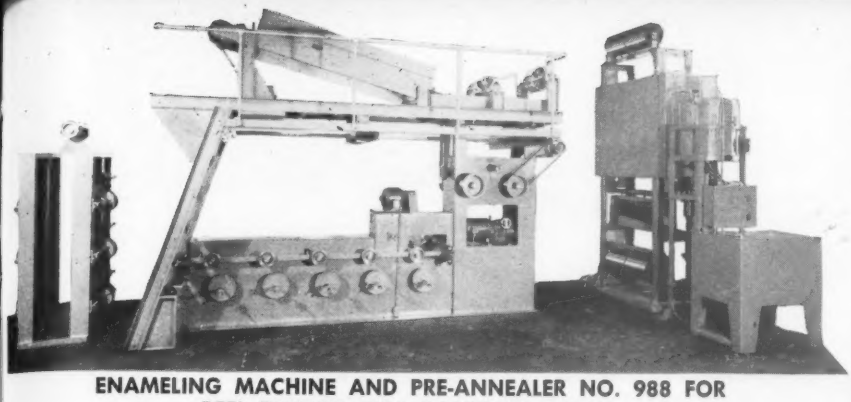
HEAVY TAKE-UP NO. 1234, BEHIND WIRE DRAWING AND TINNING.



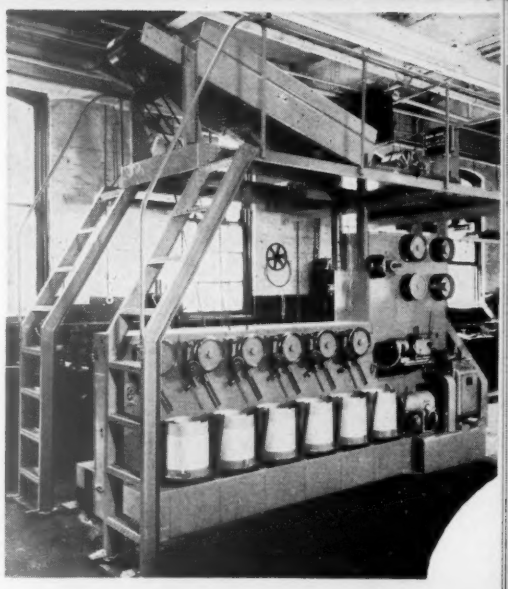
M-10 ENAMELING MACHINE NO. 1220 FOR FINE WIRES, 36 AND FINER.



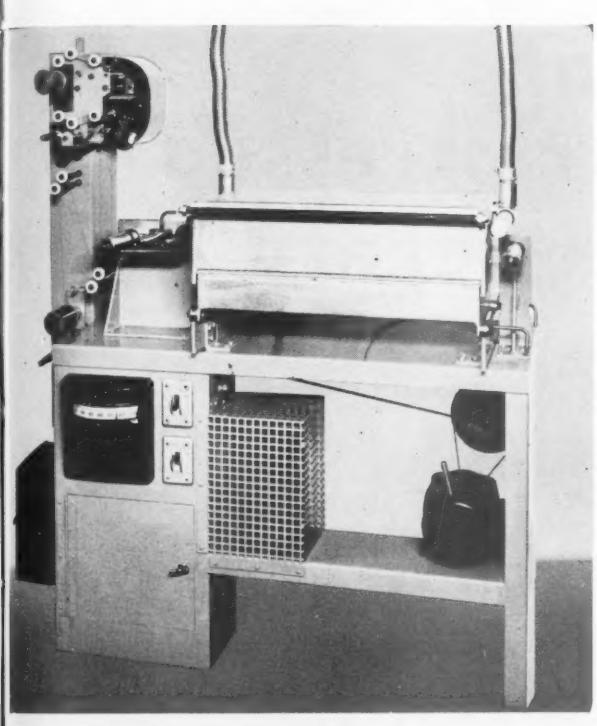
AMERICAN INSULATING MACHINERY COMPANY
FAIRHILL AND HUNTINGDON STREETS PHILADELPHIA 33, PENNSYLVANIA, U.S.A.



ENAMELING MACHINE AND PRE-ANNEALER NO. 988 FOR REEL TAKE-UP. B&S GAUGE 20 TO 30.



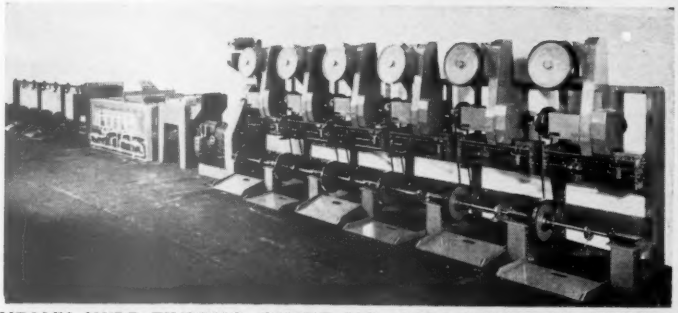
NO. 1237. SAME AS ABOVE FOR BARRELL TAKE-UP, B&S GAUGE 20 TO 30.



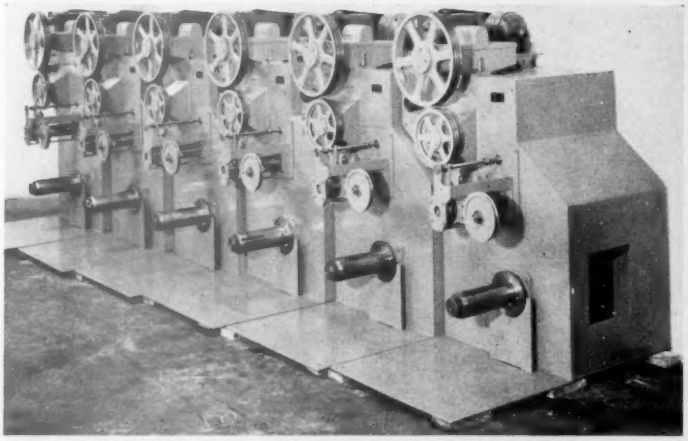
HORIZONTAL FINE WIRE ENAMELING MACHINE No. 1247

SPEEDS 50-200 F.P.M. — WIRE SIZES DOWN TO .0005 FOR ALLOY WIRES — EASY STRING UP

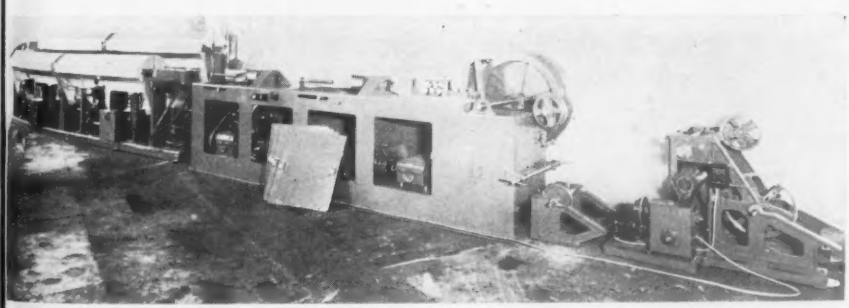
We manufacture a full line of enameling machines from the heaviest flat wires to the smallest diameters.



HEAVY WIRE TINNING OUTFIT NO. 1010 WITH GAS HEATED TINNING TANK AND AUTOMATIC HEAT CONTROL.



MULTIPLE WIRE TAKE-UP NO. 1049, 6 INDIVIDUAL UNITS, EACH REEL-ARBOR TORQUE MOTOR DRIVEN. FOR USE IN WIRE TINNING OUTFITS, ETC.



GLASS INSULATION WIRE COVERING MACHINE NO. 805, WITH ELECTRIC HEATED VARNISH BAKING OVEN.

AMERICAN INSULATING MACHINERY COMPANY
FAIRHILL AND HUNTINGDON STREETS PHILADELPHIA 33, PENNSYLVANIA, U.S.A.

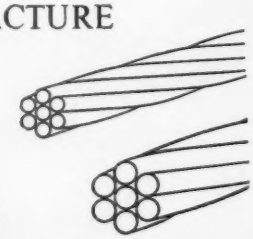
LARGE STRANDS

for prestressed concrete

❀ ❀ ❀

WE ALSO MANUFACTURE

SMALL STRANDS



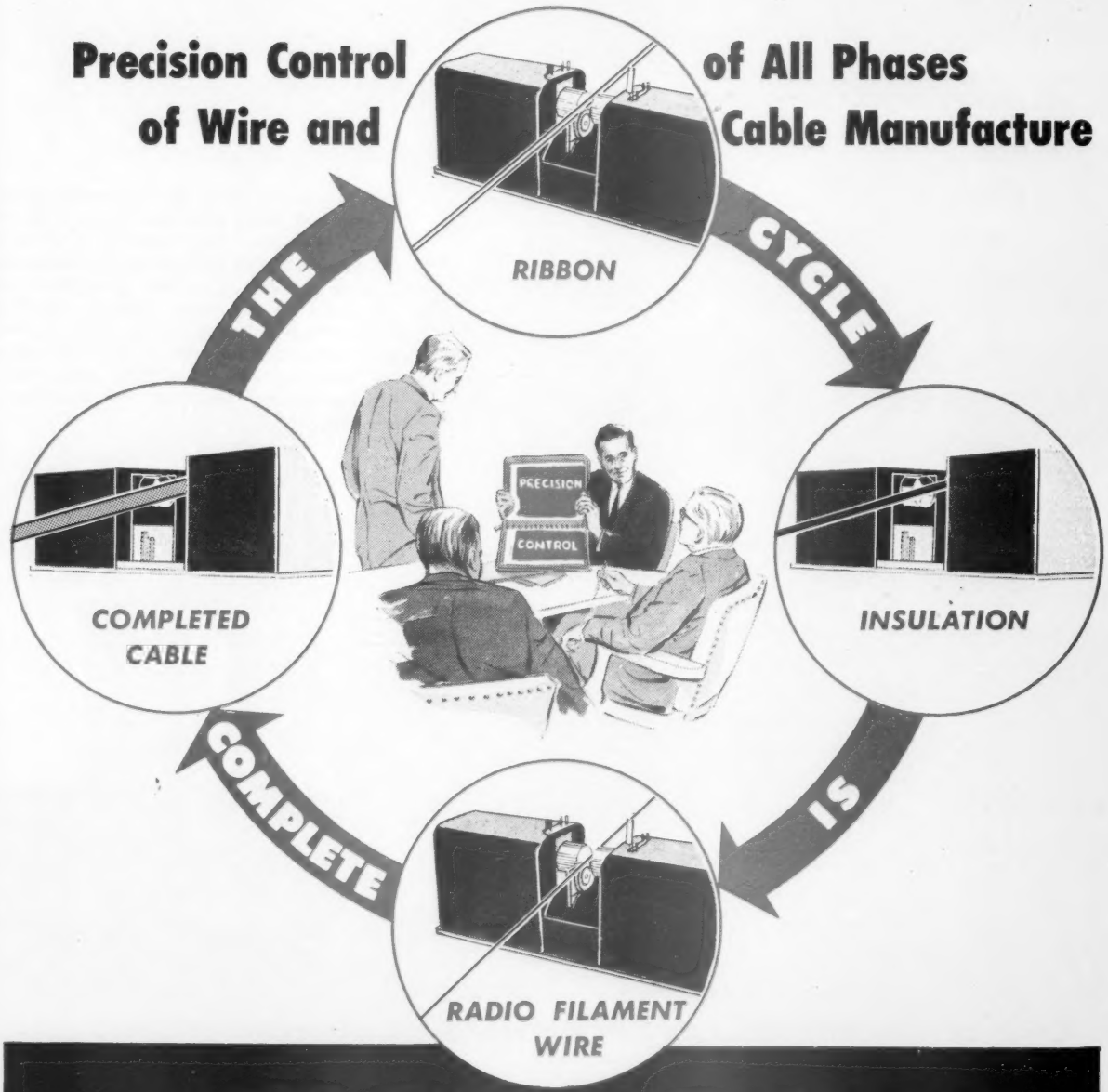
and plain, indented or crimped wires

RYLANDS

Brothers Limited

WARRINGTON
ENGLAND

Precision Control of Wire and Cable Manufacture of All Phases



THE CYCLE IS COMPLETE!

DIAMACONTROL:

- Designed to measure silk filaments unwinding from a cocoon —
- Extended to measure and control extruded cable —
- NOW returns to Micromeasurement in the field of heater filaments.

Wherever accurate measurement and control of diameters or widths are desirable and essential, the *DIAMACONTROL* is a must on:

WIRE - CABLE - COATED FILAMENTS . . .

Exacting specifications can be met with the DIAMACONTROL. We shall be pleased to supply detailed data and arrange a demonstration.

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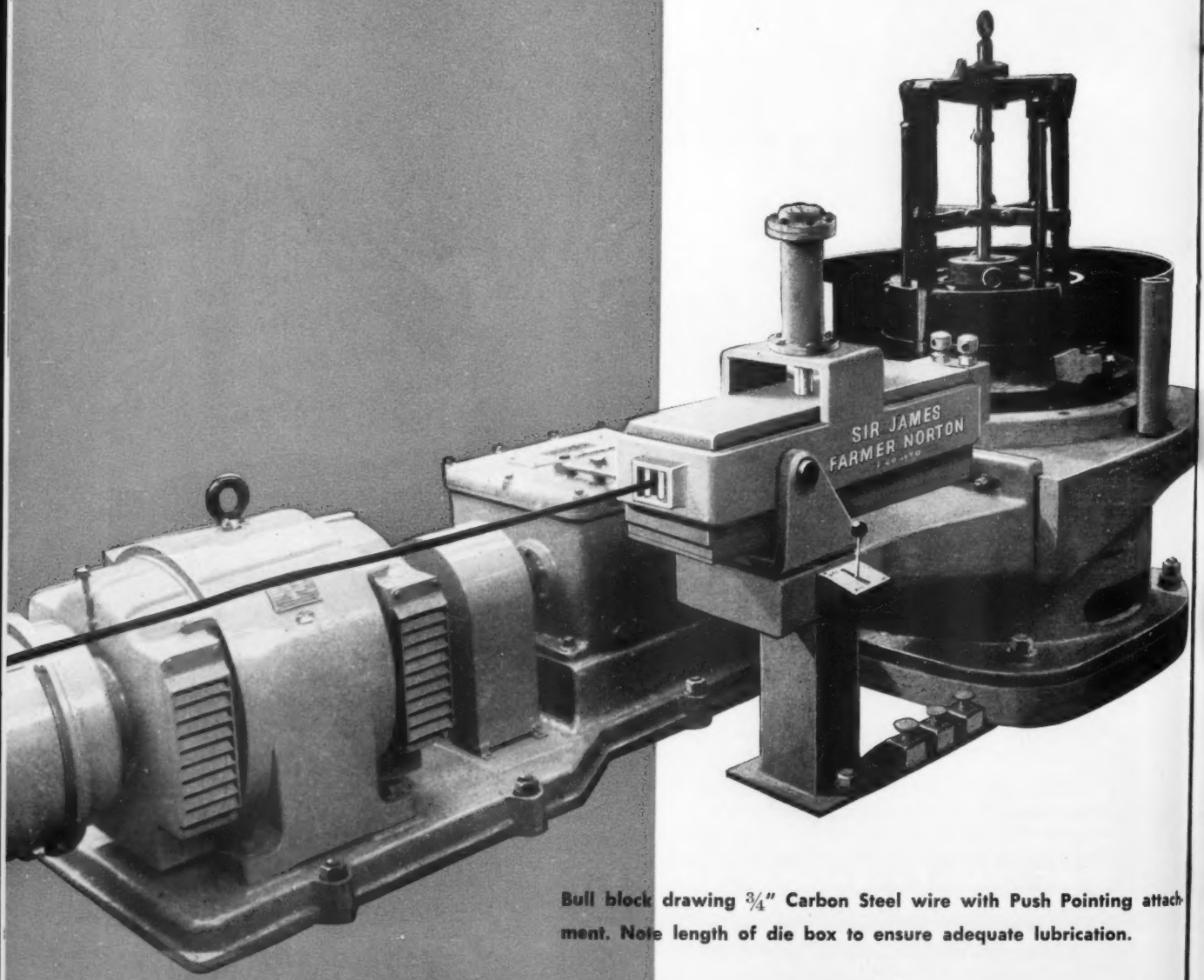
JOIN THE TREND — USE THE DIAMACONTROL

Farmer Norton

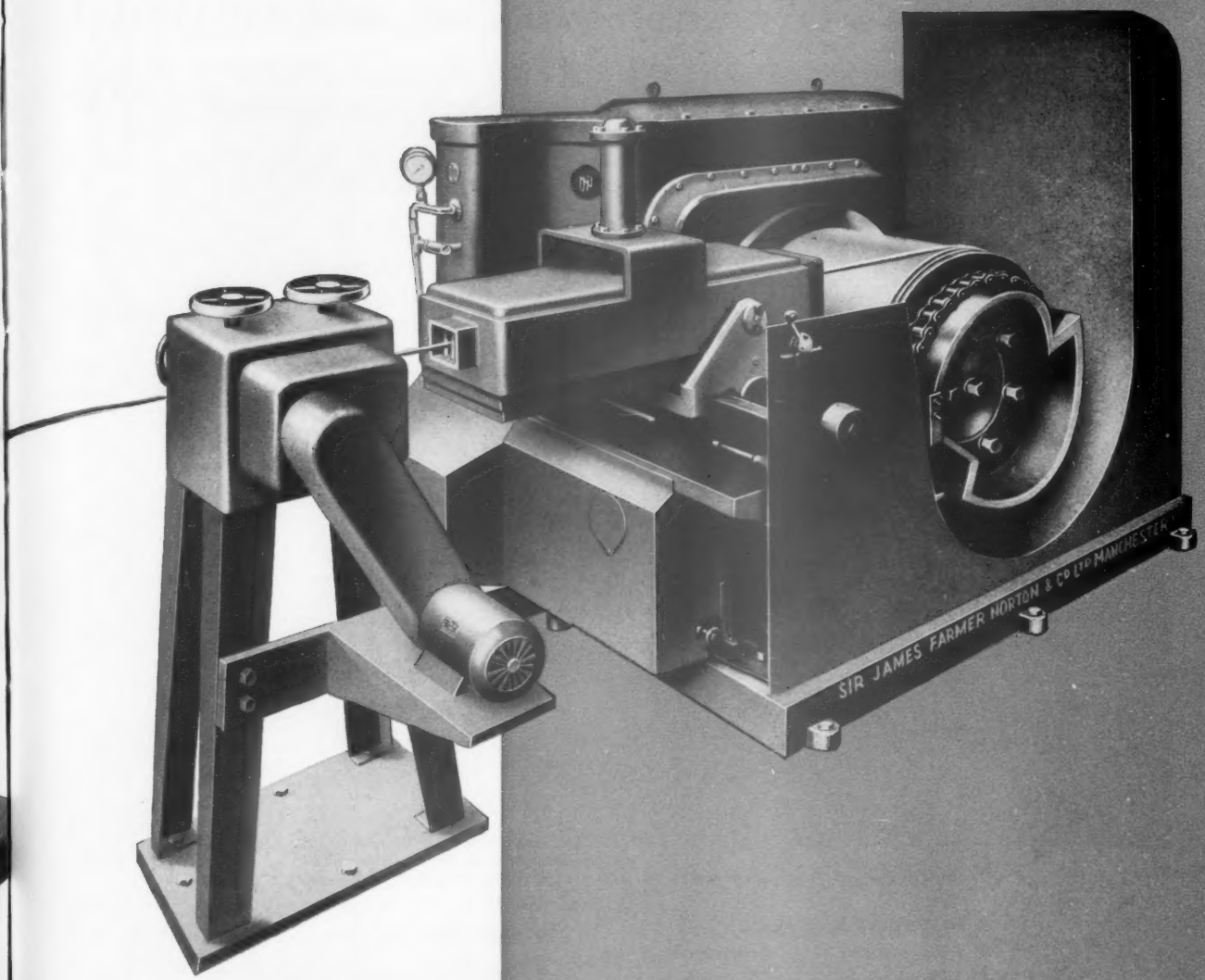
Push Pointing Units

for Wires from 1⅛" to ½" dia.

These Hydraulic Units can be fitted to practically any Bull block drawing heavy rods down to ½" diameter. The handling and pointing of heavy rods has always been a laborious and lengthy process. It is now possible to point and draw on the same machine. The Farmer Norton Push Pointing Unit straightens the first end and points the wire by driving it through the drawing die. The 'dog' may then be attached to the 'tag end' and drawing commenced.



Bull block drawing ¾" Carbon Steel wire with Push Pointing attachment. Note length of die box to ensure adequate lubrication.



Horizontal bull block for 1⅛" diameter Bolt Wire. 36" diameter block. 30ft /min. 80ft /min. 110ft /min. Straightening roll and push pointer supplied.

Sir James Farmer Norton & Co. Ltd.

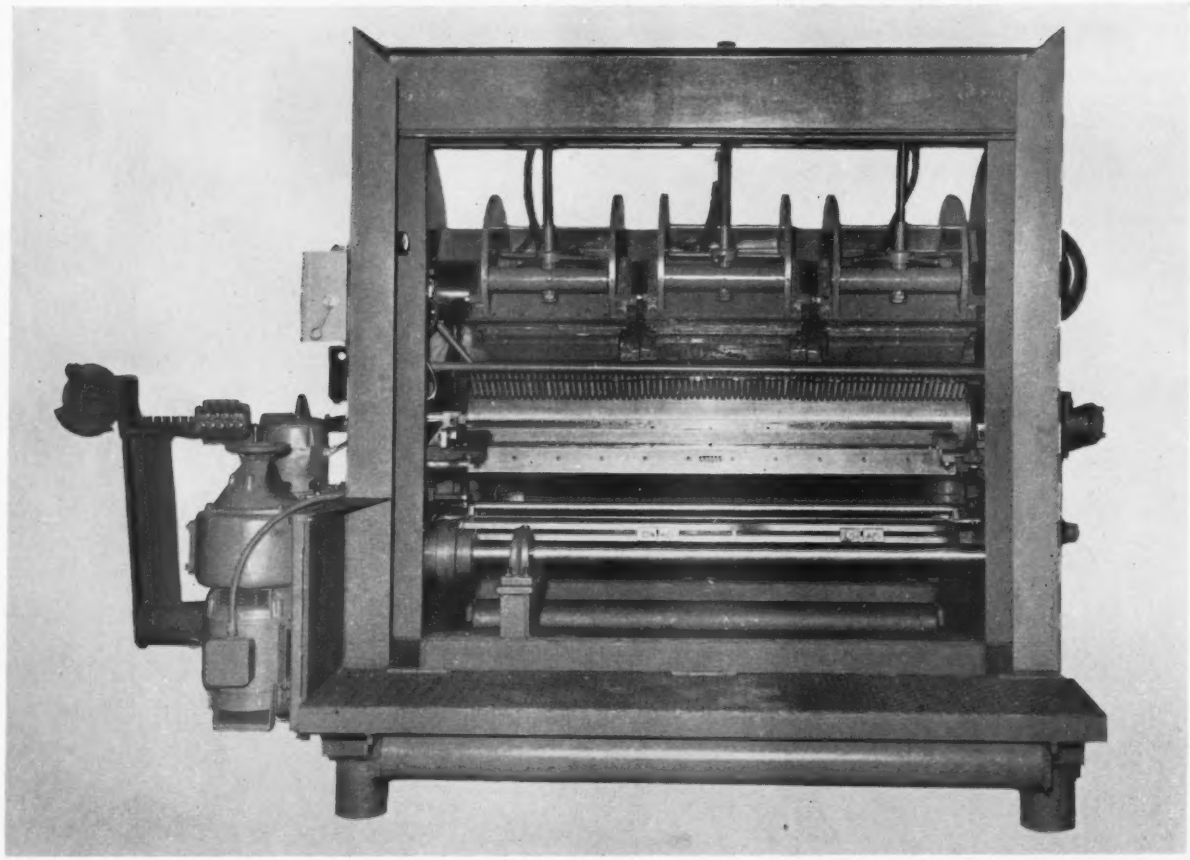
ADELPHI IRONWORKS, ADELPHI STREET, SALFORD, 3. LANCASHIRE

TELEPHONE: BLACKFRIARS 3613/4/5
TELEX NO. 66492

TELEGRAMS: 'AGRICOLA' MANCHESTER.

SOMMER

FAB-33 LIGHT WELDED FABRIC MACHINES



- **Quick change from one mesh to another**
- **High speed operation**
- **Automatically and permanently timed**
- **Full electronic control — no relay**
- **Fully synchronous timer, phase shift heat control**
- **Three phase balanced load**
- **Low original cost, low maintenance cost**
- **Unit built minimum installation time**
- **Operating in ten steel mills across the country**
- **Custom and auxiliary equipment available to your specifications**

Model FAB-33 Standard specifications:

Type of Fabric The standard fabric welder is completely equipped electrically and mechanically to produce mesh in the following sizes and spacings:

WIRE GAUGE	LINE SPACING	STAY SPACING
11½ ga. thru 12½ ga. galv.	1", 2", 4", 6" & 8"	1", 2", 4", 6" & 8"
13 " " 14½ " "	1", 2", 4", 6" & 8"	1", 2", 4", 6" & 8"
15 " " 16 " "	*½", 1", 2" & 4"	*½", 1" 2" & 4"

*** Square dies are required for ½" line wire spacing**

Galvanized welding quality wire commonly known as "open steel" is required for best results.

SOMMER PRODUCTS COMPANY

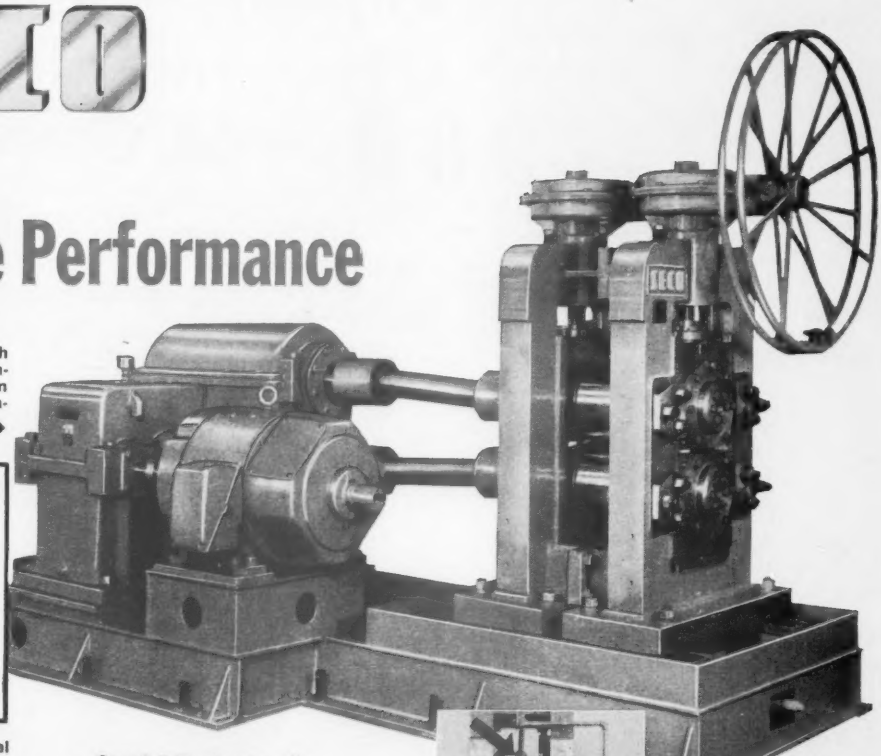
7100 S. ADAMS STREET **PEORIA, ILLINOIS**

Pioneers in wire welding since 1929.

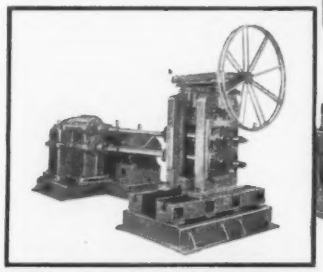
Custom Built HOT ROLLING MILLS *by* SECO *assures* Predictable Performance

Whatever your requirements . . . SECO's staff of trained engineers can help you solve any special Mill problem you may have . . . from creative designing through installation (including *all* required auxiliary equipment).

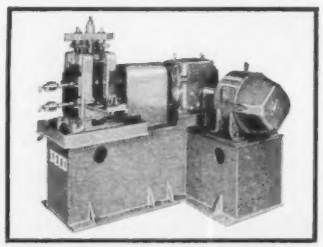
Should your problem involve a special Cluster Mill (to accommodate either ferrous or non-ferrous metals), or a Hot Rolling Mill that bonds non-ferrous metal to a steel base . . . SECO can supply.



A special, custom-built 2-high Hot Roll Flattening Mill for non-ferrous metals. (Can be built in 2 or 4-high types or a combination of both.) ▶



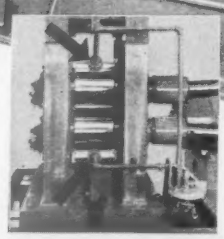
▲ A SECO designed and built Bi-Metal Bonding Mill on movable mountings.



▲ A 6-inch, 2-high Wire Flattening Mill for single or tandem use.

Special Features: ▲

- Water-cooled chocks for lubrication
- 900° F. rolling temperature
- Hand wheel screw-down (adaptable for power)
- Special alloy steel rolls
- Timken Tapered Roller Bearings
- Can be built for 8, 10, 12 or 16-inch widths.



◀ Mill is equipped with two gas jets as a means for pre-heating rolls (see arrows).

SECO

STEEL EQUIPMENT COMPANY

P. O. BOX 737, WARRENSVILLE STATION

CLEVELAND 22, OHIO

SECO STEEL MILL EQUIPMENT

- Leveling and Shearing Lines
- Combination Edging and Flattening Lines
- Tension Reels for Strip Polishers
- Narrow Strip Grinding Machines
- Slitting Lines
- Multiple Strand Pull-out Rolls and Take-up Frames
- Strip Coilers (Up and Down Type)
- Traverse Reels for Narrow Strip
- Steel Coil Up-enders
- Scrap Ballers

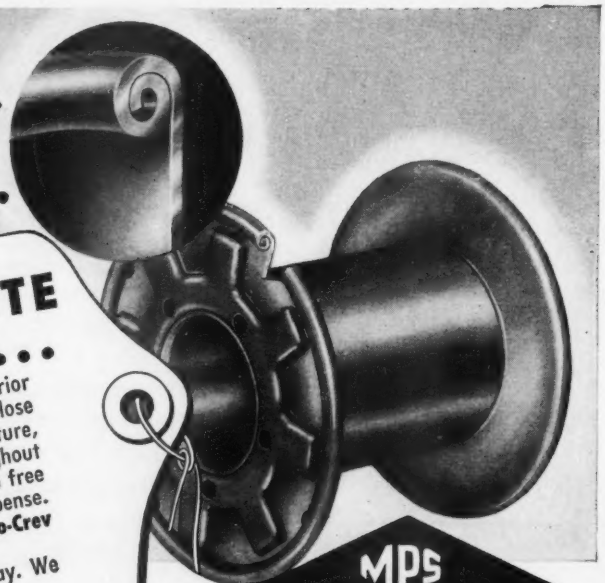
Affiliated with Lee Wilson Engineering Co., Inc.

Welcome

TO MEMBERS AND GUESTS
ATTENDING THE
1960 WIRE CONVENTION

YOU TOO SHOULD USE
SUPERIOR MPS SPOOLS AND REELS
WITH THE EXCLUSIVE HEAVY DUTY
CONVOLUTE DURA CURL RIMS

The Difference
IS HERE.....



NEW MPS CONVOLUTE
DURA CURL RIMS...

The difference between just any spool or reel and Superior MPS CONVOLUTE DURA CURL Rims is well worth your close attention. Because now, with this exclusive MPS feature, maximum strength and rigidity are obtained throughout the reel heads. You can now have continuous trouble free high speed winding, without spool straightening expense. These new MPS spools also have the famous **No-Crev** feature.
Ask about MPS CONVOLUTE DURA CURL RIMS today. We invite your inquiries.

MPS
CONVOLUTE
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Spools & Reels
give you brute strength with dimensional precision, concentricity, and balance. Another patented MPS development engineered to **help you!**

#110

18 West St., Attleboro,
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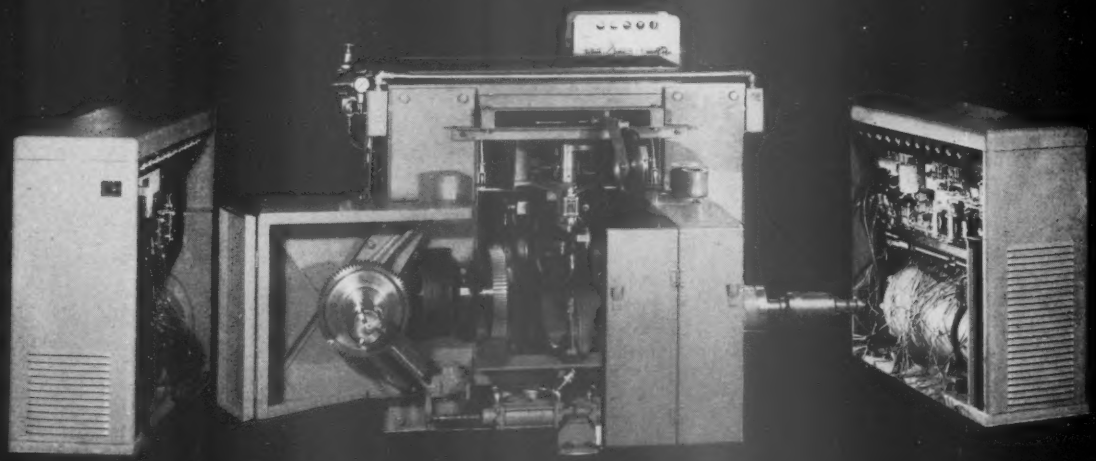
Mossberg PRESSED STEEL Corporation
DIVISION OF WANSKUCK CO.

24-HOUR AUTOMATED WIRE PRODUCTION

WITH THE NEW

LITZLER TRANSFER ★ MATED

DRAWING MACHINE TAKE-UP



★ Round-the-clock winding of all non-ferrous wire types at speeds to 5000 FPM.

★ Rugged electronic control and individual drive systems provide instantaneous transfer between dual reels—automatically!

★ Electronically measured winding of 24" or 36" reels precisely synchronized with drawbench speed and tension.

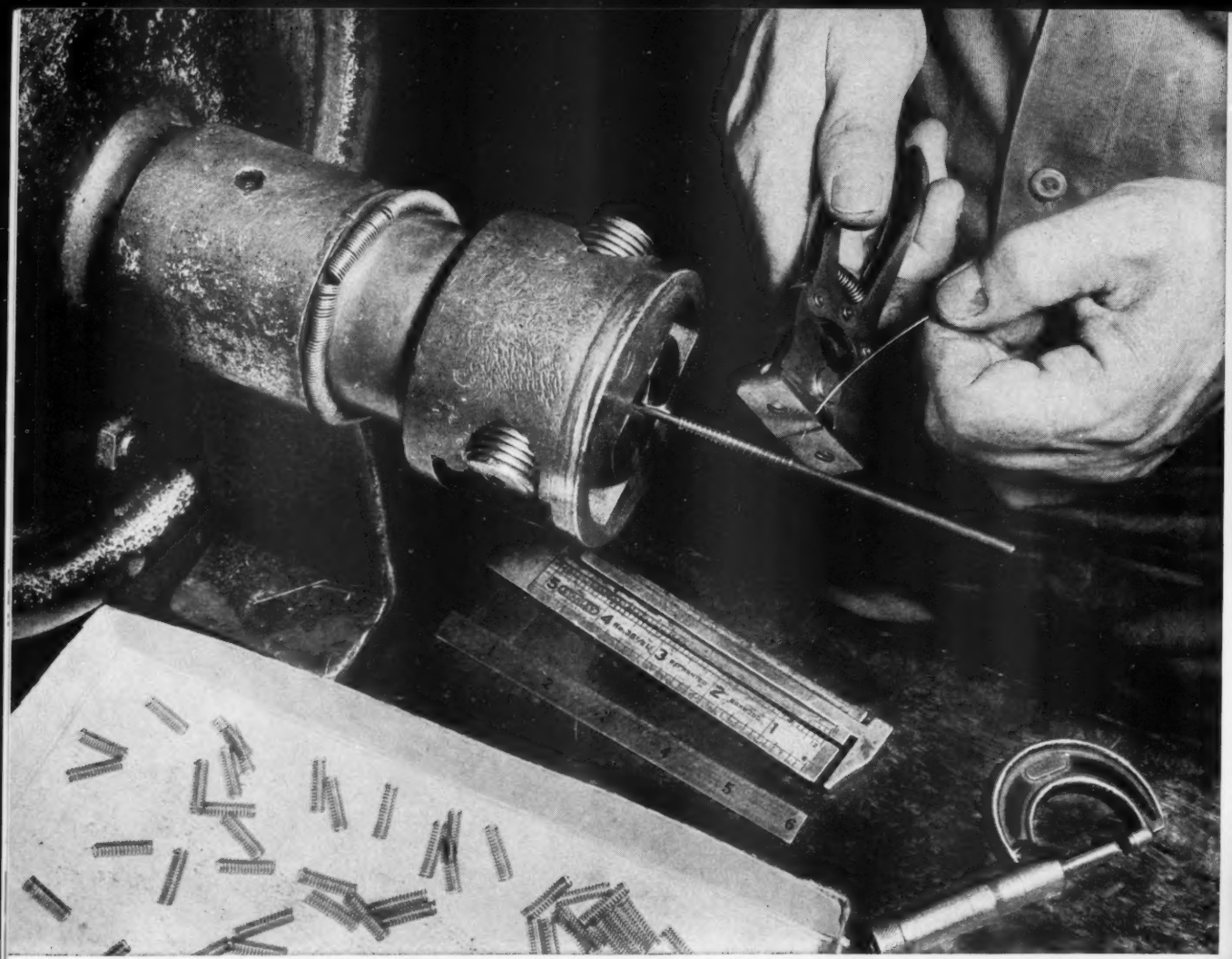
★ Pneumatic reel clamping and automatic unload-position reel delivery . . . can be arranged for end-out winding . . . adaptable to most existing drawing equipment.

C. A. LITZLER CO., INC.

SOUND ENGINEERING FOR TOMORROW'S PRODUCTION

1817 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"

EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 96 WALL ST., NEW YORK 5, N. Y.



Hand coiling of small spring orders is a skilled operation at The Yost Superior Co. in Springfield, Ohio. The company uses Johnson Music Spring Wire exclusively. Here, worker coils .012 wire into a compression spring with 16 coils having an O.D. of .196 inch. Small orders are filled overnight in this department.

Johnson Wire Speeds Overnight Delivery Of Handmade Springs

A spring maker who built a flourishing business by filling small orders practically overnight uses Johnson Steel & Wire Company's Music Spring Wire exclusively.

President L. V. Barnes of The Yost Superior Company, Springfield, Ohio, says flatly:

"Johnson Music Spring Wire is best." Since 1924, when a merger of Superior Spring Co. and Yost Gearless Motor Co. formed The Yost Superior Co., the firm has concentrated on producing custom-made springs and wire forms.

In one day recently, five telephoned orders for small lots of springs all specified the quickest possible delivery. "Three of those orders went out the same day and the other two were shipped the next morning," said William H. Craig, secretary-treasurer who heads production and purchasing activities.

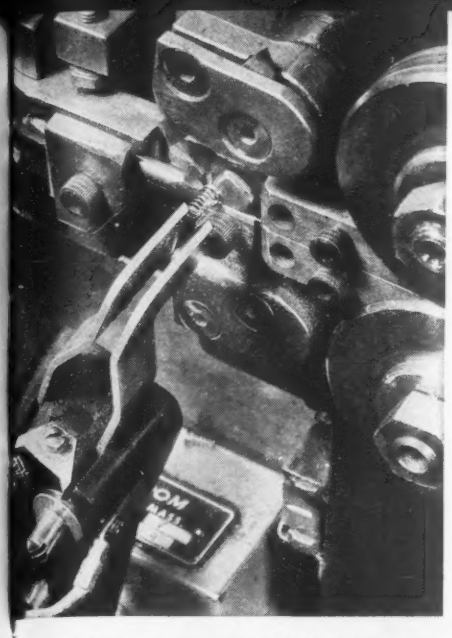
Three factors are all-important to Yost Superior. They are:

• **Spring Making Skill** — Yost Superior's bonus incentive plan, the long tenure of its employes and its steady growth for more than a half-century all demonstrate the company has a skilled work force which knows and practices the art of spring making.

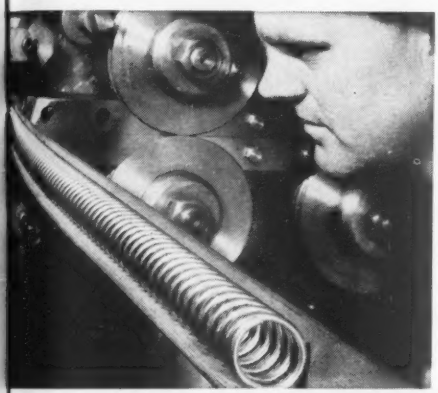
• **Sizable Inventory**—Large wire stocks, usually running around 500 tons, are always on hand in Yost Superior's stock room. Mr. Craig said: "Our customers depend on us to supply their needs quickly. That means large stocks of wire sizes commonly used." He added:

"Johnson Music Spring Wire is so good—consistently—that we feel confident in laying in a large supply. We don't worry about quality varying from coil to coil or shipment to shipment. We can depend on wire we buy today to match the properties and performance of wire we bought a year ago.

"When we order from Johnson,



Electronic gager on this Torrington W10A Coiler measures to .005 inch in determining whether each spring coiled is the proper length. Springs rejected by the gager are blown to the side while good springs fall into container. Spring being coiled is made of .010 inch Johnson Music Spring Wire. It has an O.D. of .121 to .126 inch and is 5/16 inch long. It takes 1,000 springs to weigh a quarter pound.



Coiling a long spring on a Torrington W12A coiler from Johnson .120-inch diameter Music Spring Wire. The 95 coils in this spring measure 30-1/2 inches in length. Each coil has an O.D. of 1-1/16 inches.

we get quick delivery from warehouses in Akron or Chicago."

• **Good Raw Materials** — President Barnes said: "We demand the utmost in uniformity of diameters, finishes, tempers and physical properties. We get it from Johnson Steel & Wire Co.

"We don't have to ask for service. It's given us without asking. And Johnson Music Spring Wire has worked well for us. I would say their wire is the best. One hundred percent testing of finished springs proves it.

"We're accustomed to holding the diameter of springs — and often spring lengths — to tolerances stated in thousandth's, so we've got to have good wire. Johnson Music Spring Wire helps us meet specs and its performance helps us meet load requirements."

While Yost Superior makes springs in large production runs for everything from grass seed spreaders to missiles and rockets, its Hand Department is a key operation.

In the Hand Department where orders for less than 100 springs or wire forms are filled, Johnson Music Spring Wire proves itself.

Coiling springs by hand means high labor costs so it's important to keep them down to a minimum or the cost of making a few springs would go sky high. Here cost of the wire is insignificant but quality of the wire is most important.

• **Quality Comes Through** — That's because there's little or no time for experimenting or trial runs. The Hand Department pays off because the spring maker knows his business and uses Johnson Steel Wire with its predictable performance qualities.

Yost Superior uses the full range of Johnson Music Spring Wire from .008 inch diameter up to .250 inch to make all kinds of compression, extension and torsion springs as well as a bewildering array of wire forms.

That's a good recommendation for any spring maker. Whatever your needs for Music Spring Wire or any other fine wire specialty, you can count on Johnson Steel & Wire Co. to give you the same consistent quality and good service which pleases Yost Superior.

You can get better wire and better products, starting today. Just call the nearest district sales office, listed here, and talk to a Johnson man who knows wire and production problems.

Grinding of spring ends on a Besly Grinder. These compression springs, made of .047 inch O.D. Johnson Music Spring Wire, are only 9/16 inch long and have an O.D. of 13/32 inch. On this machine, the closed ends are being ground square.

Coils of Johnson Music Spring Wire are delivered to the Coiling Department from Yost Superior's large stock room. The company normally carries an inventory of about 500 tons of wire.

Johnson Steel & Wire Company, Inc.

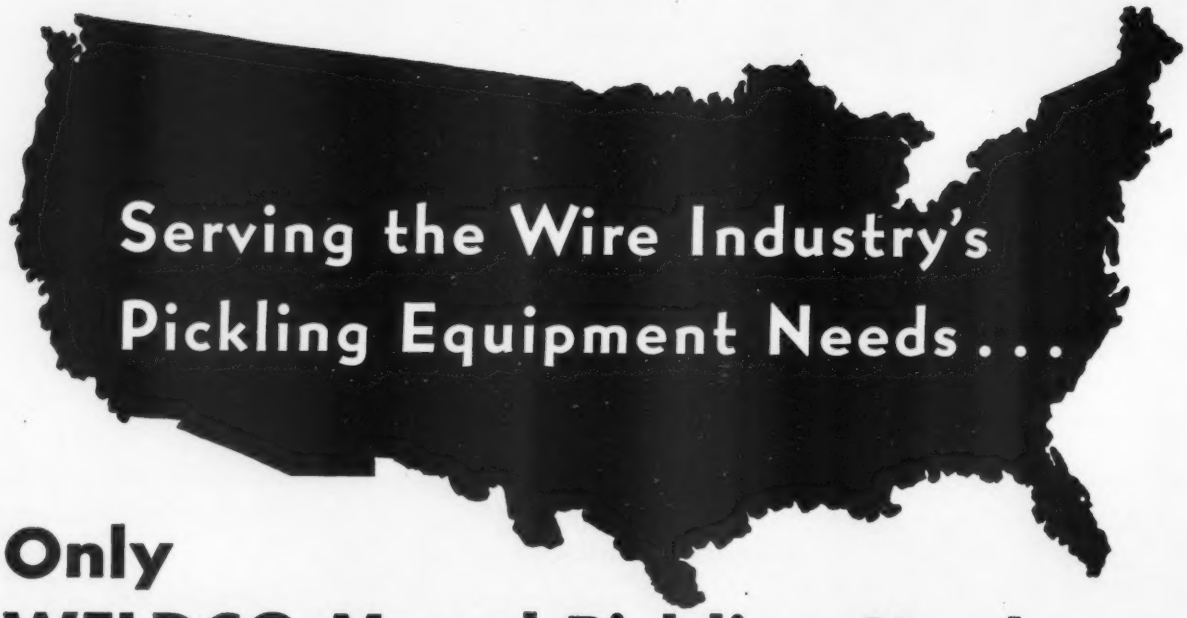
Worcester 1, Massachusetts

a subsidiary of **Pittsburgh Steel Company**

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES

Akron, Chicago, Cleveland, Dayton, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Tulsa, Warren, Ohio



Only WELDCO Monel Pickling Hooks Have Such Universal Acceptance!

OTHER WELDCO PICKLING EQUIPMENT

Mechanical Picklers, Crates, Baskets, Racks, Chain, Steam Jets, and Accessories

WELDCO

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Detroit Steel Corporation - - - - - - - Portsmouth, Ohio
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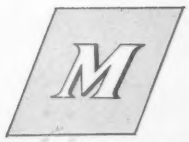
Indiana Steel & Wire Company - - - - - - Muncie, Ind.
Johnson Steel & Wire Co. - - - - - - - Worcester, Mass.
Jones & Laughlin Steel Corporation - - - - Aliquippa, Pa.
Keystone Steel & Wire Company - - - - - - - Peoria, Ill.
Lamson & Sessions Company - - - - - Cleveland, Ohio
National Screw & Manufacturing Co. - - Cleveland, Ohio
Pittsburgh Steel Company - - - - - - - - Monessen, Pa.
John A. Roebling's Sons Corporation - - Roebling, N. J.
Timken Roller Bearing Company - - - Gambrinus, Ohio
Union Drawn Steel Division - - - - - - Massillon, Ohio
Washburn Wire Company - - - - - - - New York, N. Y.
Wickwire Spencer Steel Division - - - - - Buffalo, N. Y.

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY
3724 OAKWOOD AVENUE · · YOUNGSTOWN 9, OHIO



THE MONTGOMERY COMPANY
EST. 1871
WINDSOR LOCKS, CONNECTICUT
NATIONAL 3-3336

BARE ELECTRIC TINSEL CONDUCTORS

Used in Cords For:
Telephones — Radios — Electric Shavers — Hearing Aids. Used bare for voice coil lead wires on loud speakers.

FINE WIRES

NON-FERROUS FINE WIRES

Bare Copper — OFHC — Cadmium Copper, also Coated with Tin — Silver, etc. Hard or annealed. Aluminum. Put up Single on Spools or multiple wound on Braider Bobbins. Also Stranded.

TINSEL LAME
(FLAT WIRE)

FOR RIBBONS AND GARLANDS

Silver and False Gold Coated Copper — for Tinsel Ribbons and Garlands.

KNITTED MESH AND CURLED WIRE — FLAT AND ROUND

FOR MUFFLING OF SOUND FOR AIR CONDITIONING AND OIL AND GAS FILTERATION AND ENTRAINMENT FOR VIBRATION & SHOCK ABSORBING CUSHIONS
FOR ELECTRONIC SHIELD FOR FILTERS & MIST ELIMINATORS
POT CLEANERS — STAINLESS STEEL SPONGES FOR USE IN HOME, SHOP, GARAGE
CLEANS BROILERS, GRILLS, FRYPANS WILL NOT DISCOLOR ENAMEL
FOR INDUSTRY — RESTAURANTS — KITCHENS OF INSTITUTIONS, MEAT PACKERS.
FOR CLEANING UTENSILS, USED IN BAKING HAMS AND OTHER MEATS, IN FACTORIES, FRYING POTATO CHIPS, BARBECUING CHICKEN AND SO FORTH

WRITE OR TELEPHONE TO TINSEL HEADQUARTERS FOR QUOTATIONS

THE MONTGOMERY COMPANY

25 CANAL STREET Est. 1871 Tel.: National 3-3336 **WINDSOR LOCKS, CONN.**

Where wire men meet...

talk turns to Apco Mossberg

Wherever wire and wire rope handling problems are discussed — at high level conferences or on production lines — men mention Apco Mossberg in the same breath with steel reels, spools and bobbins. And for good reasons.

SEE OUR MEN
at the
La Salle Hotel
Chicago
November 14-17

Reasons such as Apco's staff of engineers. These are men long experienced in the ways of efficient wire drawing, reeling and spooling. Men with proven ability to come up with practical solutions . . . answers which often pay off in substantial production and shipping economies. Then, too, there are the men behind the men . . . skilled craftsmen working with modern, high speed production facilities to bring you custom engineered units in any size or design.

Together these wire-wise men can make short work of your toughest handling problem. Try them and see at your earliest opportunity.

APCO MOSSBERG COMPANY
Lamb Street, Attleboro, Mass.

Announcing the NEW HUD-PAK

HIGH SPEED WIRE PAYOFF PACKAGE

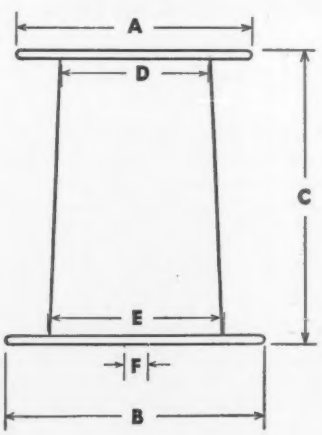
Are You Looking For High Quality Bare Or Coated Wire In The Most Modern Up-To-Date Package?

- High Speed Payoffs.
- Controlled Tensions For Single And Multiple End Winding Operations.
- Large Payoff Packages.
- A Rugged Container To Protect Wire In Use Or Storage.
- Instantaneous Starts And Stops.
- All At Regular Wire Prices.

The exclusive new HUD-PAK is the most important money-saving development in wire packaging in 20 years. With many conductor and AWG sizes, users report record payoff speeds in excess of 5000 feet a minute. HUD-PAK reduces waste from short spools. Its tapered barrel spool—and absence of inertia found with rotating spools—permit instantaneous starts and stops with no danger of wire shakedown and tangle.

We are currently supplying HUD-PAKS containing bare copper wire, tin plated, silver plated, and aluminum wire. Other types are being developed. Optimum results can be obtained within the size range of AWG 38 to AWG 24.

The term "HUD-PAK" is a trade-mark of Hudson Wire Company



	A	B	C	D	E	F
HUD-PAK 120	10"	11"	13½"	6½"	7½"	1¼"
HUD-PAK 50	8½"	9½"	9⅞"	6"	7"	1¼"

CAPACITIES

MATERIAL	Approx. Weight (lbs.)	
	120	50
COPPER	120	50
CADMIUM COPPER	120	50
ALUMINUM	37	16
BRASS 70/30	115	48
PHOSPHOR BRONZE	120	50
NICKEL SILVER	115	50
STEEL	107	44

HUDSON WIRE COMPANY
OSSINING DIVISION, OSSINING, NEW YORK
TELEPHONE: WILSON 1-8500

TWO NEW SOLUTIONS FOR "HOT" WIRE PROBLEMS

...FROM YOUR SILICONES MAN

Two new low shrink silicone rubber insulating compounds... developed by the UNION CARBIDE Silicones Man... are now solving many of today's electrical wire and cable insulation problems. Offering good dielectric and physical properties with easy processing, they are ideal materials for air frame applications, motor truck wires, motor leads and hook-ups, small appliance wiring, and marine wiring.

UNION CARBIDE K-1347 Silicone Compound is a premium quality stock that meets tight military and industrial specifications. It has high green strength, remilling is easy, and it is readily colored for coding. Easily extruded, it provides a smooth, non-porous, high gloss surface, and can be braided without postcure. Physical properties are excellent using either steam or hot air cures.

For economy operations where good, but not premium, physical properties are needed, lower cost UNION CARBIDE K-1357 may well fill all requirements. Available precatalyzed in both slabs and coiled strips, it can be fed directly from carton to extruder on most equipment.

Both silicones have outstanding retention of tensile strength and elongation after prolonged exposure to high temperature. Both have dielectric strength of 1000 volts/mil. Both can be cured with either steam or hot air. And both are low shrink compounds. K-1347... for premium properties. K-1357... for economy.

For more information, write or call your UNION CARBIDE Silicones Man, or Dept. JZ-9905, Silicones Division, Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *(In Canada:* Bakelite Company, Division of Union Carbide Canada Limited, Toronto 12, Ontario.)

Unlocking the secrets of silicones

Rubber, Monomers, Resins, Oils and Emulsions

UNION CARBIDE **SILICONES**

"Union Carbide" is a registered trade-mark of UCC.

METTLER

PROUDY

ANNOUNCES

THIS BRAND NEW

HIGH SPEED

SHUSTER

Model 1V18

⅛" CAPACITY

DOLLAR SAVER

COMPARE ! !

PRICE

PRODUCTION

and PROFIT

SHUSTER

MODEL 1V18

WIRE STRAIGHTENING AND CUTTING MACHINE
VARIABLE SPEED ELECTRICALLY CONTROLLED

The Production Booster with infinite variable speed control and The New Electro Mechanical Positive Release Target

Illustrated is the new 1V18 SHUSTER AUTOMATIC WIRE STRAIGHTENING and CUT-OFF MACHINE. Many new features are included as Standard Equipment on these High Speed ⅛" capacity machines.

Features include: High Speed Straightening Arbor with elongated split dies for proper bearing surface and optimum straightening speed, new Shuster Electro-mechanical positive release target, with electrically controlled tripping mechanism to instantaneously operate roll type clutch. Feed roll housing and fly wheel are Timken bearing equipped. All mechanisms are mounted on Shuster Welded Steel Base. Also included are new improved Guide Bar, Guide Bar Cover and a new Angled Control Panel together with properly engineered working height.

There are more SHUSTERS in use throughout the world than all other machines of its type.

200 CUTS PER MINUTE

CAPACITIES 1V18

.062 to .125 basic wire

25 to 150 F.P.M.

Production:

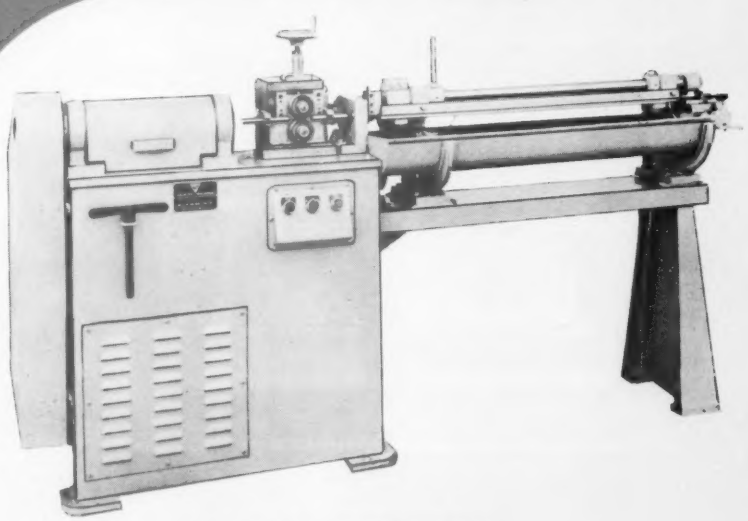
Lengths up to 8"
200 pieces per minute

Lengths up to 10"
150 pieces per minute

SINCE 1866

SHUSTER

Wire Straightening and Cut-off Machines and Components are built in 49 models from .020" to 11/16" Mettler Machine Tool also manufactures the SHUSTER 5/16" capacity. Thread Rolling Machines



SEE IT IN OPERATION
AT THE CHICAGO WIRE CONVENTION

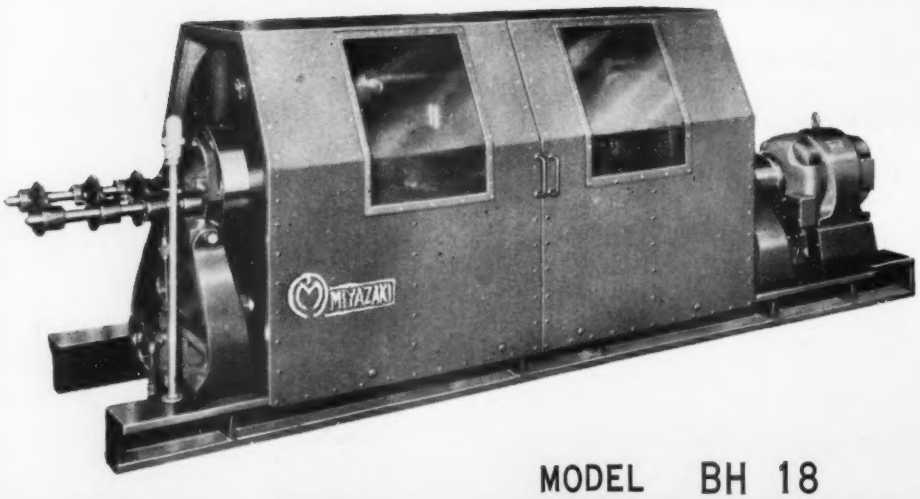
METTLER MACHINE TOOL, INC.

Boulevard Industrial Park
New Haven, Conn.

MIYAZAKI'S

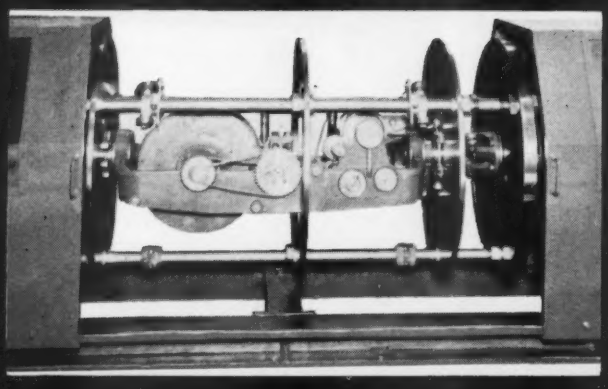
HORIZONTAL TYPE, DOUBLE-TWIST

BUNCHING MACHINE



MODEL BH 18

TWIST:
Right or left hand



BH 14

Take Up Bobbin Dia.	350 mm
Bobbin Capacity	80 kg
Max. Speed	1000 rpm

BH 18

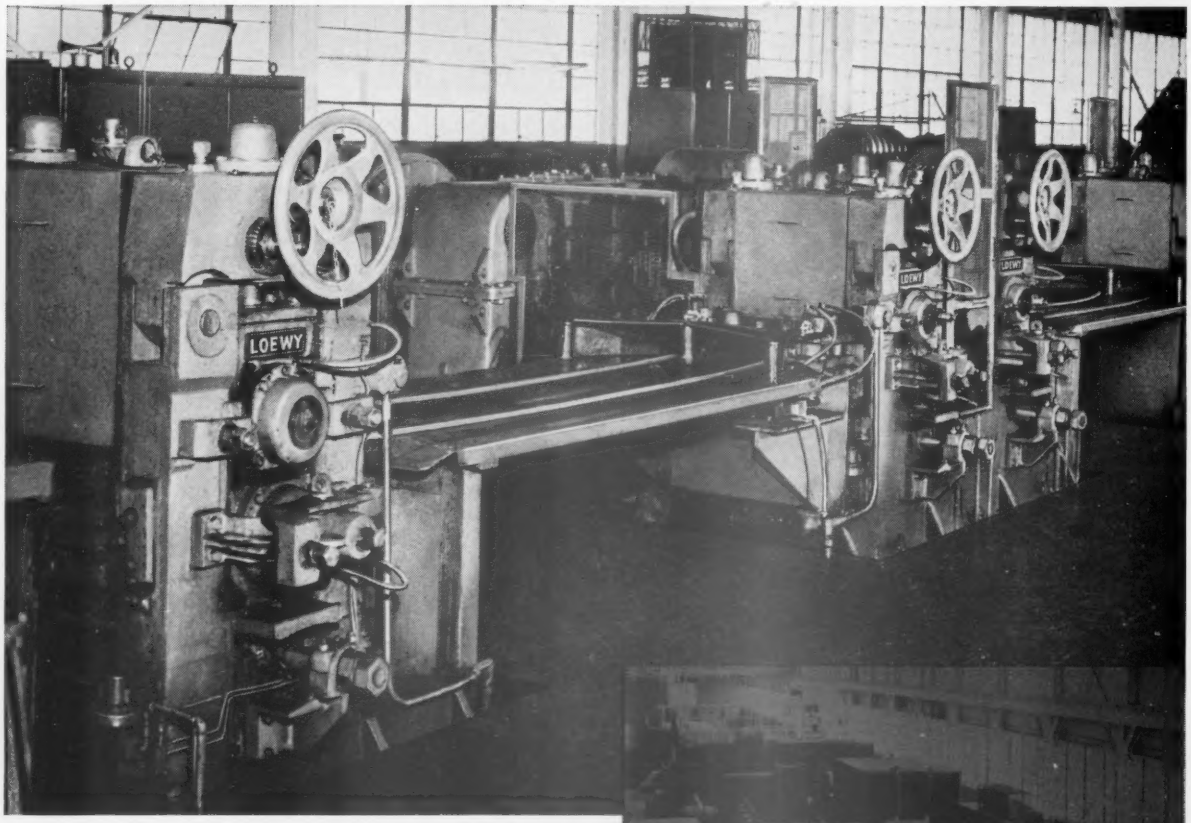
Take Up Bobbin Dia.	450 mm
Bobbin Capacity	200 kg
Max Speed	900 rpm

BH 24

Take Up Bobbin Dia.	600 mm
Bobbin Capacity	400 kg
Max. Speed	800 rpm

Miyazaki Iron Works, Ltd.
Kaizuka, Osaka, Japan.

NOW! "LOEWY-COMPACT" MILLS for the economical production of copper wire rod



Loewy copper wire rod mill installation—part of 12 and 10-in. continuous finishing train showing entry side for 2-strand operation.

Overall view of 14-pass continuous Loewy wire rod mill

In 1955 Loewy introduced an automatic rolling installation for copper wire rod—a radical departure from the conventional layout. The Loewy concept differed fundamentally from the customary looping stand, which was serviced by tong men and required a considerable crew of highly skilled operators. Loewy has now taken another major stride.

The new "Loewy-Compact" mill features remarkable compactness and automation, optimum precision, and highly economical design. Heretofore it was considered uneconomical to roll smaller quantities of copper wire rod. The capital investment and the space requirements involved in a continuous wire rod mill seemed prohibitive for companies of limited size or those restricted in plant area.

Studies have demonstrated that wire rod in smaller quantities can be profitably produced on this new Loewy wire rod mill.

Avail yourself of our services in order to hold your own in the competitive market. Write Dept. 1-10, outlining your requirements.

BALDWIN · LIMA · HAMILTON

INDUSTRIAL EQUIPMENT DIVISION • PHILADELPHIA 42, PA.

BALDWIN BLH LIMA-HAMILTON

A-1053

THE BEELINE WIRE

A BEELINE DG-5 for manufacturing Pre-stressed Concrete Wire
up to .276" finishing size.

DRAWING MACHINE

WORLD WIDE

PRECISION WITH RUGGEDNESS

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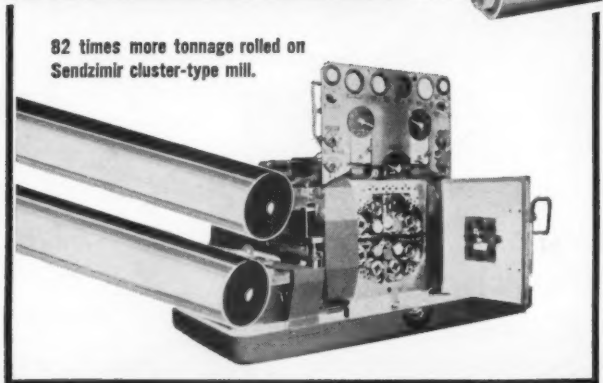
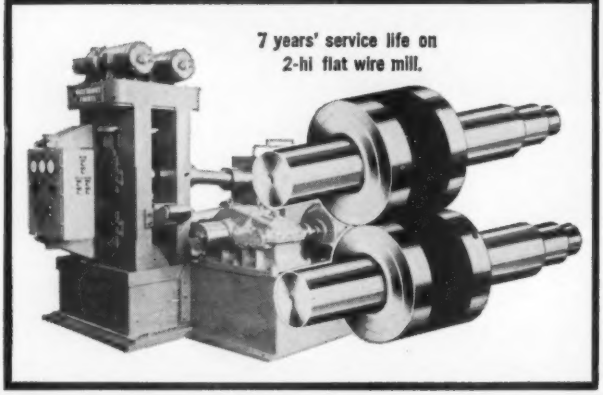
19002 LOMOND BLVD.
CLEVELAND 22, OHIO
TELEPHONE: WYoming 1-5830

. . . ANOTHER TALIDE CASE HISTORY

20 YEARS' SERVICE WITH Talide® ROLLS at Jones & Laughlin Steel



82 times more tonnage rolled on Sendzimir cluster-type mill.



7 years' service life on 2-hi flat wire mill.

The Youngstown, Ohio plant of JONES & LAUGHLIN STEEL CORPORATION'S STAINLESS AND STRIP DIVISION (formerly Cold Metal Products Co.) reports that the TALIDE (Tungsten Carbide) work rolls used on their 4-hi cold rolling mills give INCREASED PRODUCTION, LONG SERVICE, FINE FINISH AND EXTREMELY CLOSE TOLERANCE. Over 25 pairs have been purchased during the past 20-year period —many of which are still in operation producing high quality strip steel of all analyses.

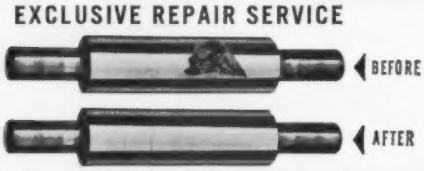
Metal Carbides pioneered and developed the original installations of tungsten carbide rolls and has successfully adapted them to all types of rolling mills including STECKEL, BLISS, UNITED, MESTA, STANAT, SENDZIMIR, WATERBURY-FARREL, TORRINGTON, RUESCH, FENN, WEAN, COLD METAL, LOMA, LOCKWOOD, TAYLOR, etc.

Talide work rolls are ultra-hard, extremely dense and porous-free. Strip steel and non-ferrous metals of all analyses are rolled down to thinner gauge, with more accuracy, greater reductions and with fewer anneals than possible with any other roll.

ONLY TALIDE WORK ROLLS GUARANTEE THESE ADVANTAGES

- ★ MORE PRODUCTION
- ★ BETTER FINISH
- ★ LONGER LIFE
- ★ HIGHER SPEEDS
- ★ CLOSER TOLERANCE
- ★ IMPROVED PHYSICALS
- ★ GREATER REDUCTION
- ★ LESS DOWN TIME
- ★ FEWER REJECTS
- ★ LESS MAINTENANCE

EXCLUSIVE REPAIR SERVICE



Broken or damaged carbide rolls can be reworked to first-class condition with all defects eliminated at one-half original cost. Only Metal Carbides offers this service—because of its exclusive hot press method.

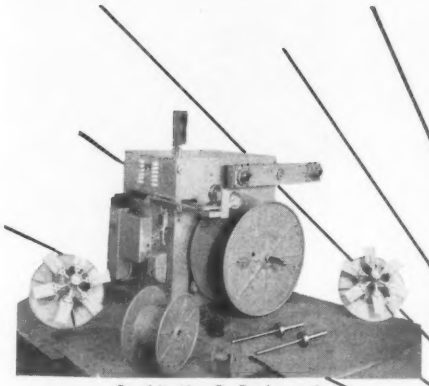
Talide Rolls are made in lengths up to 100" diameters up to 25", and up to 5000 lbs. by weight.

METAL CARBIDES CORPORATION
Youngstown 12, Ohio
Send for new 16-page catalog CR-59

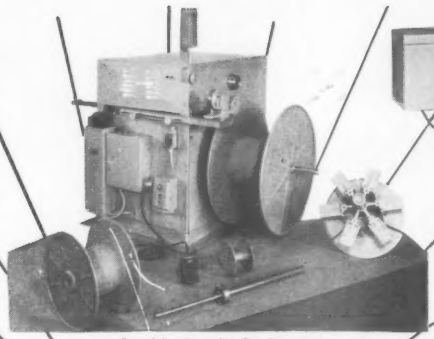
SUPERSET GRINDING WHEEL

The Superset diamond grinding wheel was specially developed for grinding carbide rolls to highest possible surface finish and luster. Made of 4-8 micron size diamond dust, it imparts a surface finish far superior to any other commercial wheel. Available in sizes up to 25" diameter.

METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



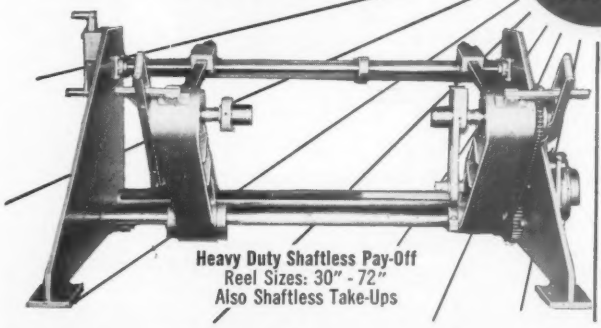
Combination Re-Reeler and
Re-Spooler with Indexing Head



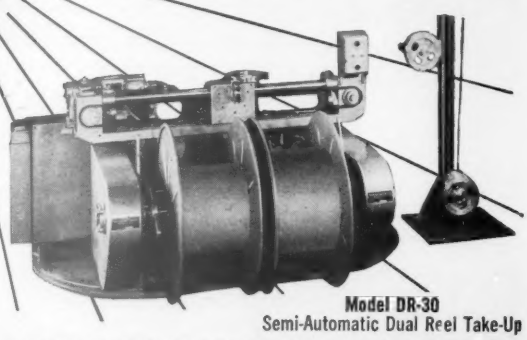
Combination Re-Reeler and
Re-Spooler with Interchangeable
Shaft Features

High Voltage
Spark Tester

FOR ACCURACY — DAVIS WIRE & CABLE EQUIPMENT — FOR DEPENDABILITY



Heavy Duty Shaftless Pay-Off
Reel Sizes: 30" - 72"
Also Shaftless Take-Ups



Model DR-30
Semi-Automatic Dual Reel Take-Up

THE NEWLY REDESIGNED *DAVIS WIRE & CABLE EQUIPMENT* IS BETTER THAN EVER

Modernized, streamlined and engineered for fast production of safely insulated wire and cable, the newly redesigned DAVIS ELECTRIC line of Spark Testers, Pay-Offs, Take-Ups, Counters, Spoolers, Traverses and Capstans is now offered as the finest ever conceived and produced by DAVIS ELECTRIC engineers. Before you buy, you owe it to your pocketbook as well as your business reputation to learn what this unexcelled machinery can do to better satisfy your customers (and your stockholders!). Refinements and advancement in designs qualify the 1960 DAVIS ELECTRIC line to surpass in performance previous DAVIS products in use in 80% of the industry's wire mills and some of which have been in operation for 15 years without maintenance problems!

What better tribute to quality can one ask?

Write for complete details and find out how DAVIS ELECTRIC can improve your wire and cable production and promote profit in your plant.

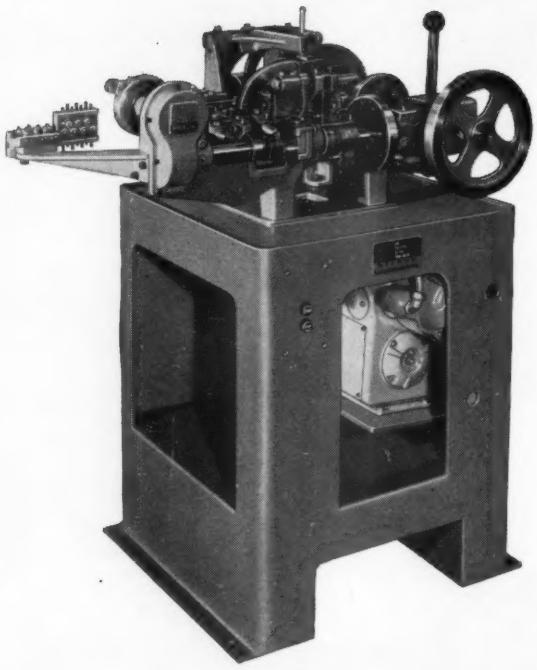
DAVIS ELECTRIC CO.

WALLINGFORD, CONNECTICUT

DAVIS WIRE & CABLE EQUIPMENT

DUAL and SINGLE TAKE-UPS • PAY-OFFS • CAPSTANS
SPARK TESTERS • RE-SPOOLERS
RAM-TYPE TEFLON EXTRUDERS

PRECISION MINIATURE PARTS PRODUCED WITH SPEED & ECONOMY on a NILSON #00 FOURSLIDE MACHINE



NILSON #00 machine.

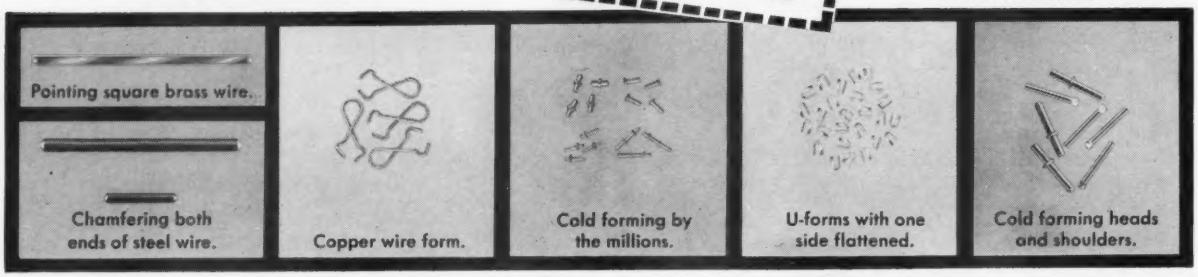
Up to 10,000 parts/hour—miniature electrical, electronic or mechanical components made of ferrous, non-ferrous, alloys, Kovar, Rodar and precious metals.

WIRE FORMING

from 0.010"-0.040" diameters on NILSON #00 Fourslides.

ALL PARTS SHOWN ACTUAL SIZE

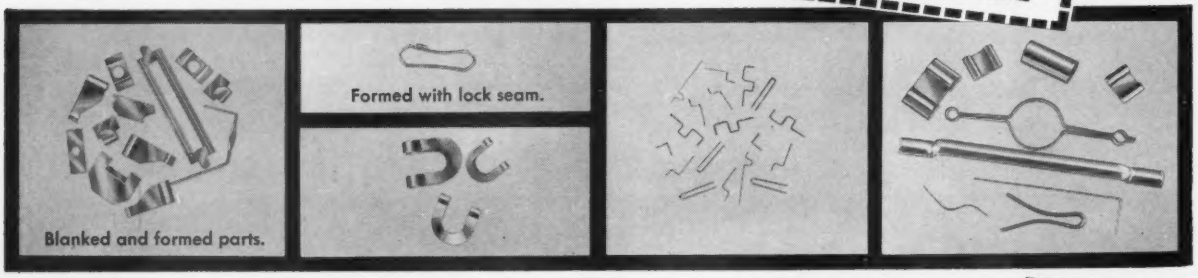
Parts are shown through courtesy of Art Wire & Stamping Company Newark 2, New Jersey


Pointing square brass wire.
Chamfering both ends of steel wire.
Copper wire form.
Cold forming by the millions.
U-forms with one side flattened.
Cold forming heads and shoulders.

RIBBON METAL FORMING

Tolerances held ±0.0005" when required.

ALL PARTS SHOWN ACTUAL SIZE



NILSON

A. H. NILSON MACHINE COMPANY

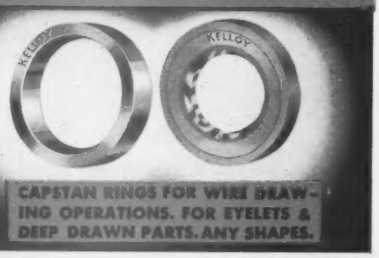
Write today for FREE CATALOG #62 on the 17 Models of NILSON FOURSLIDES.

625 Bridgeport Avenue • Shelton, Conn. Telephone: WAverly 9-1433

FOR PRECISION AND ACCURACY

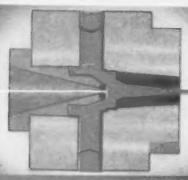
Specify "KELLOY" CARBIDE SHAPE DIES

WEAR RESISTANT PARTS. BUSHINGS, GUIDES, CRIMPING, EDGING AND COATING DIES, etc.

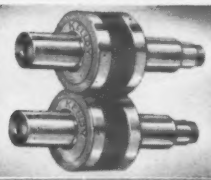


CAPSTAN RINGS FOR WIRE DRAWING OPERATIONS. FOR EYELETS & DEEP DRAWN PARTS. ANY SHAPES.

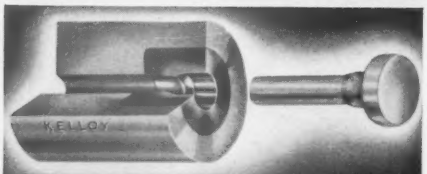
NON-FERROUS SHAVING DIES



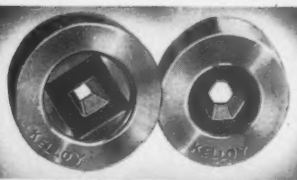
SELF ALIGNMENT PRECISION HEAD & EXTRUDING TOOLS FOR EXCHANGE CABLE INSULATING



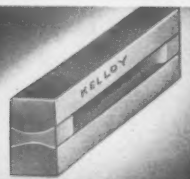
WIRE FLATTENING ROLLS. TRUE SURFACE FOR HIGH QUALITY FLAT WIRE.



BOLT SIZING DIES. COMPLETE AND READY TO USE. CLOSE TOLERANCES.



SHAPE DIES WITH SHARP TRUE CORNERS FOR ACCURATE PRODUCTION.



SIDE AND END BLOCKS. COLLAPSIBLE DIES FOR DRAWING BAR STOCK.

KELLOY CORPORATION
NEW YORK 1, N. Y.

DOSCO Wire Mill uses Cleveland

A *tremendous number* of Cleveland Tramrail cranes serve the many wire drawing blocks. They place wire onto the reels and strip drawn wire from the blocks.

This large room of nail machines is provided with complete coverage of Tramrail cranes. The carriers have rigid arms which make it easy to push carriers and cranes. The electric hoist push button is also conveniently located at the lower end of the arms.

Tramrail *Extensively*

Every department in the fine modern Etobicoke Plant of Dominion Steel and Coal Corporation, Ltd., in suburban Toronto, Canada, is equipped with Cleveland Tramrail Equipment.

Because Tramrail cranes roll so easily, even when loaded to capacity, nearly all are hand-propelled with only the hoists being motorized. The cleaning house gantry crane is, of course, power driven, having two motors on the bridge travel and one on the hoist.

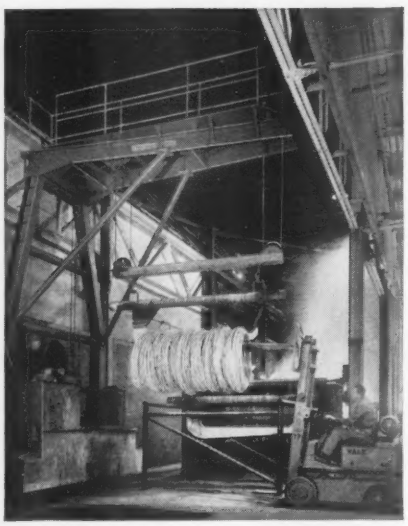
A big advantage recognized in Cleveland Tramrail equipment is its unique construction which makes it easy to relocate and adapt to various materials handling requirements.

Dosco is a large producer of nails, wire fencing and other wire products.

Cleveland Tramrail has had wide experience in the application of materials handling equipment for all phases of wire and rod production.

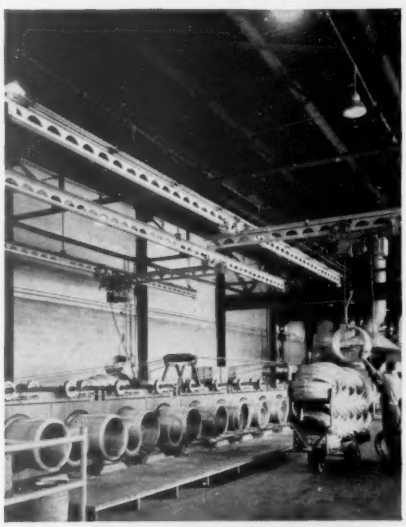
Our engineers will be glad to study your problems and make recommendations without obligation.

This battery of nail cleaning tumblers is served by a completely motorized three-runway crane. Bucket loads of nails are dropped directly into the tumblers. Cleaned nails are discharged from the tumblers into buckets in the pit below. These buckets are removed by the crane.



All wire is cleaned and lime-coated with the Cleveland Tramrail cleaning house crane. This is a very efficient operation, as only one man in the crane cab is required. Cleaned wire is lifted directly off the crane hook by a floor truck, thus eliminating a time-consuming step in handling.

Wire is quickly stripped from the continuous wire-drawing machines with these cranes.



Both ends of the patented annealing and galvanizing furnaces are served by Cleveland Tramrail equipment. Three hand-propelled cranes with electric hoists remove the coils from the take-up stands.

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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 9228 E. 284 ST. • WICKLIFFE, OHIO

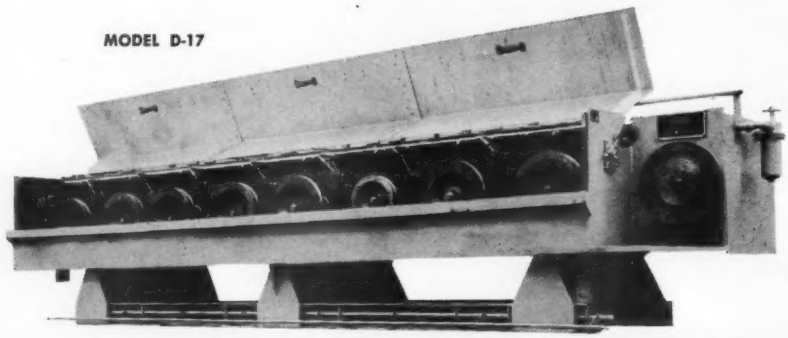
now, reduce 5/16" copper rod to #34 B&S gauge wire in only 2 steps

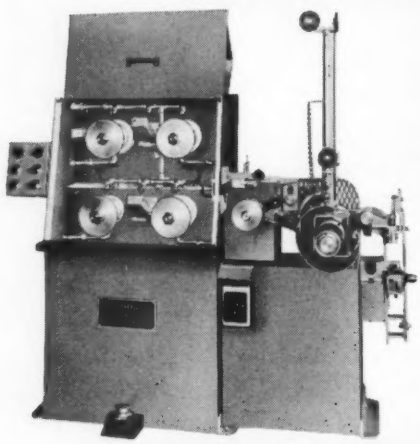
COOK

EQUIPMENT ELIMINATES 1 MACHINE LOWERS PRODUCTION COSTS

Now, with only 2 machines, in only 2 production steps, you can reduce 5/16" copper rod to #34 B&S gauge ANNEALED* wire. By eliminating one step, you save the cost of one machine and the cost of producing unnecessary intermediate wire sizes. And, with these Cook machines, you'll produce the highest quality wire at speeds up to 5,000 feet a minute.

MODEL D-17





MODEL F-31

Maximum Size of Entering Rod	5/16" Copper 3/8" Aluminum
Finished Wire Size	No. 8 to No. 19 B&S Gauge
Maximum Operating Speed	5000 F.P.M.
Maximum Number of Dies	17
Number of Drawing Blocks	8
Maximum Size of Die Case	1½" dia x 1" thick
Spool Capacity	1000 lbs.
Spool Traverse	11"
Spool Diameter	30"
Motor Size	150 HP

Maximum Wire Entering Size	#14 B&S Gauge
Finished Wire Size	#26 to #34 B&S Gauge
Operating Speed	5000 F.P.M.
Maximum Number of Dies	16
Number of Drawing Shafts	4
Size of Die Case	1" x ½" thick
Motor Size	15 HP
Spool Capacity	40 to 90 lbs.
Spool Flange Diameter	8" to 12"
Spool Traverse	6" to 8"

*** MODEL F-31 (above) available as a combination drawing and annealing machine**

COOK MANUFACTURING CO.

50 EAST 25th STREET, PATERSON, N. J. • ARmory 4-6380

CANADIAN AGENT
E. V. LARSON CO., LTD., TORONTO, CANADA

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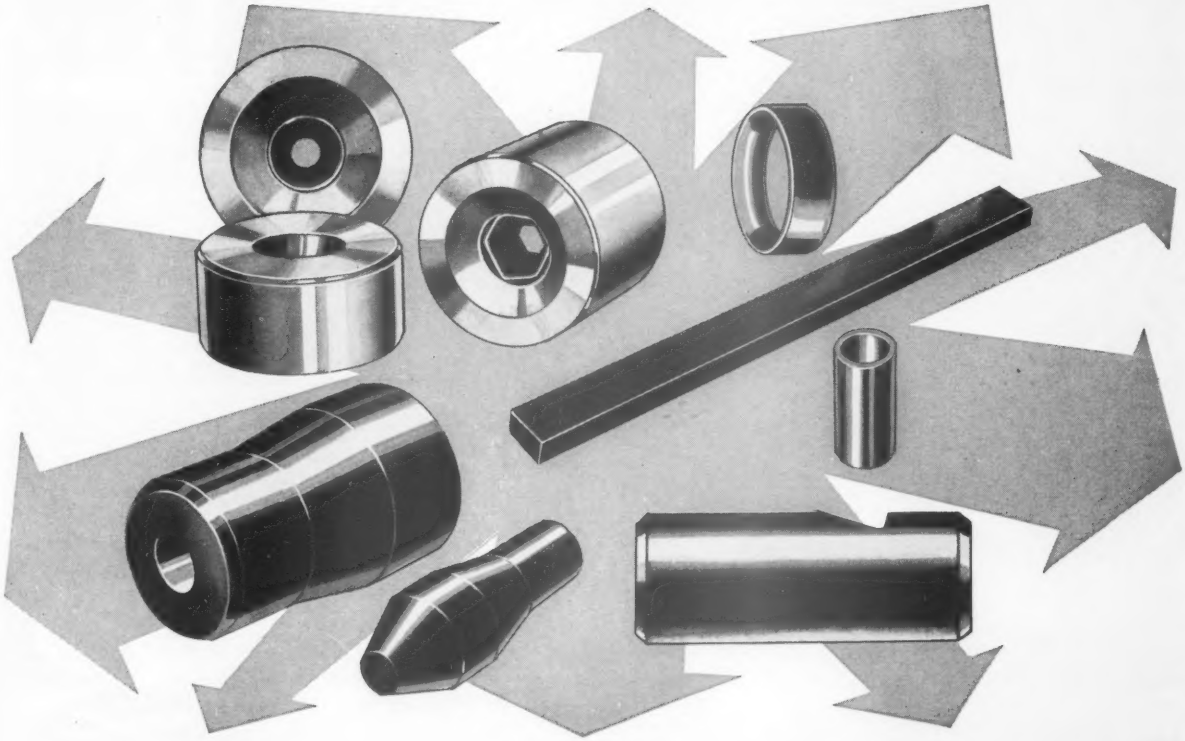
Metallurgical Memo from General Electric

"MOVING METAL" with Carboloy® cemented carbides



The best known method to perk up production efficiency!

HOW CARBOLOY QUALITY PAYS OFF . . .

- maintains calculated accuracy longer
- more production per die

The product is given:

- better grain structure . . . better finish
- less waste—fewer rejects

This could be the perfect time to take a fresh look at your production picture. Every day, manufacturers are discovering the multiple "pay-off" derived from General Electric Carboloy quality cemented carbides . . . designed to "move metal" at *lower cost*, with *less* waste.

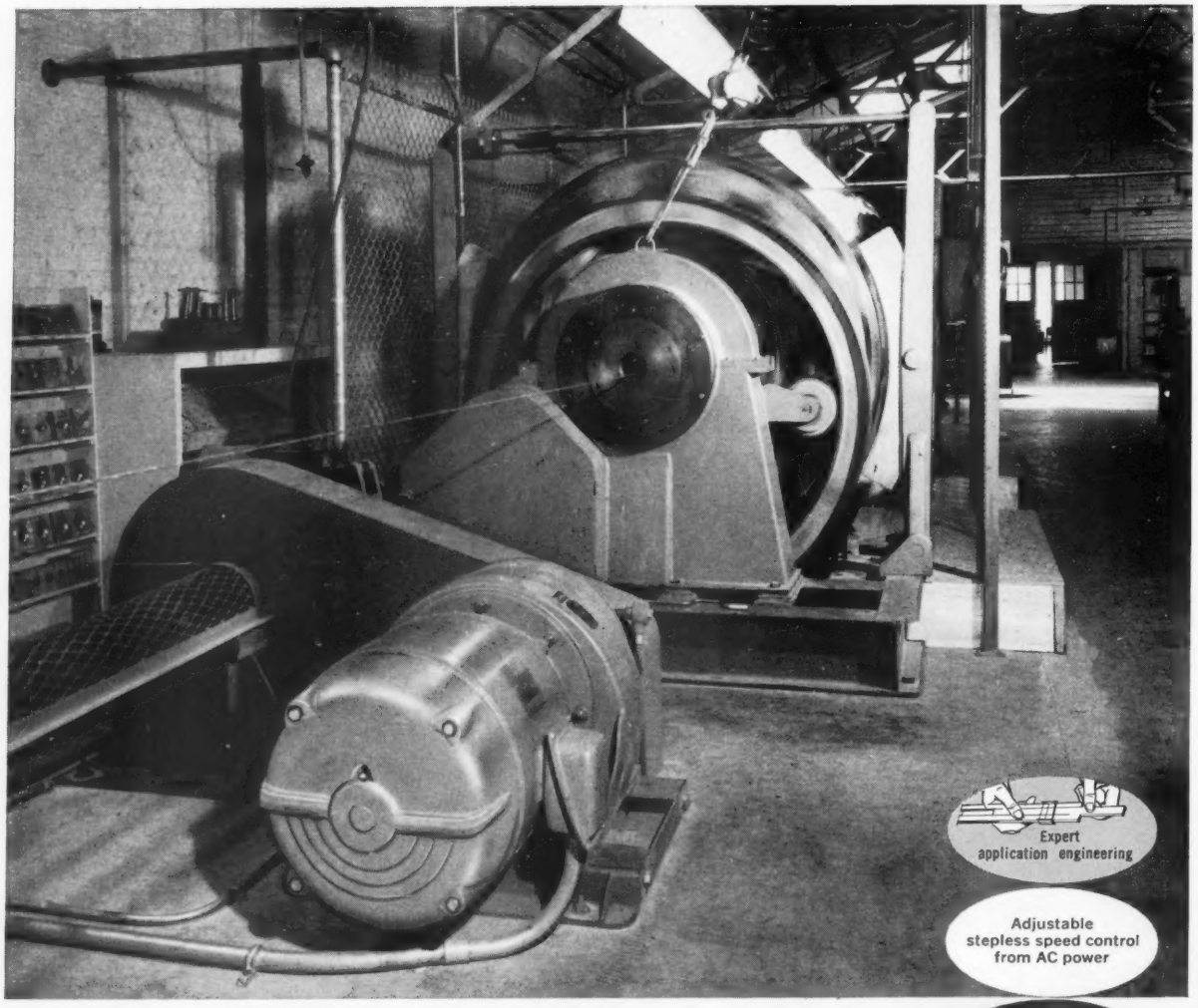
But that's only part of the picture. They have learned from experience that General Electric metallurgists have given them carbides second to none in quality . . . in standard or special dies for wire, bar and tube forming. The sustained accuracy of the work output . . . the finer finish of the end product and productive life of the dies are proof-positive of Carboloy superiority. Your authorized Carboloy Die Distributor or Die Maker can help you "move metal" at lower cost. Call him today. Metallurgical Products Department of General Electric Company, 11171 E. 8 Mile Ave., Detroit 32, Michigan.

CARBOLOY
CEMENTED CARBIDES

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS



Stepless speed control provides the right twist for cabler

Louis Allis Ajusto-Spede® Drive automatically adjusts speed and/or tension for twisting fine strands into multi-conductor cable

Significant product improvement can be made in cable production if your cablers and other wire processing equipment are equipped with Louis Allis Ajusto-Spede drives and control, like the 50 hp unit shown above.

Here's how it works: You just select the speed you want, and the Ajusto-Spede delivers it steplessly. The drive glides into top speed because acceleration is precisely controlled at all times. The result: proper tension on wires for high-speed cable production with a minimum of strand breakage, downtime, and waste.

The Louis Allis Ajusto-Spede Drive can bring you the same benefits wherever you need precise control of adjustable speed and/or tension to make or process wire. Other applications include wire drawing machines, stranders, extruders, capstans, wind-ups, etc.

Let Louis Allis tailor the Ajusto-Spede drive for one machine — or to provide precise "one dial" master speed control for a multi-drive system. Sizes from 1 to 100 hp, with a broad range of electrical and mechanical modifications to meet your needs.

Contact your nearby Louis Allis District Office for further information and application help, or write for Bulletins 2750 and 2800 to the Louis Allis Company, 451 East Stewart Street, Milwaukee 1, Wisconsin.

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LOUIS ALLIS

A5-214

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

SINGER

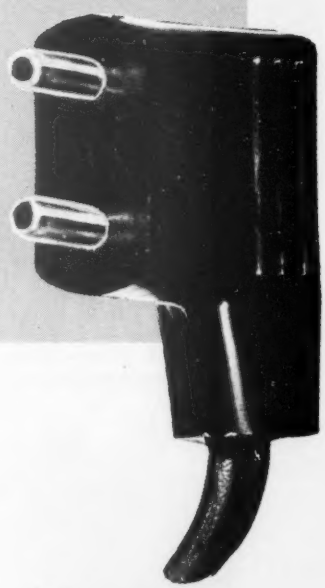
World-renowned Sewing Machines —

feature

BLACAR®

molded vinyl plugs!

The applications for top quality, electrical grade BLACAR compounds for molding (as well as extrusion) are virtually countless. A typical example of a special-purpose molding application is that employed by The Singer Manufacturing Co. — leading manufacturers of sewing machines — who rely on superior performing BLACAR UL-approved compounds for molding electrical plugs and insulating wire.



For this particular molding application, the specific requirements were met by **Cary's BLACAR Compound #3070** — providing: low molecular weight, exceptional clarity and color, uniform particle size, superior heat stability, unequalled electrical properties, etc.

There is a BLACAR Resin or Compound tailored for your particular end use — be it an extrusion, injection molding, or calendering application.

Learn what BLACAR can do for your products— write for technical assistance, working samples or data.

CARY CHEMICALS INC.

Mail address: **P. O. BOX 38, EAST BRUNSWICK, N. J.**

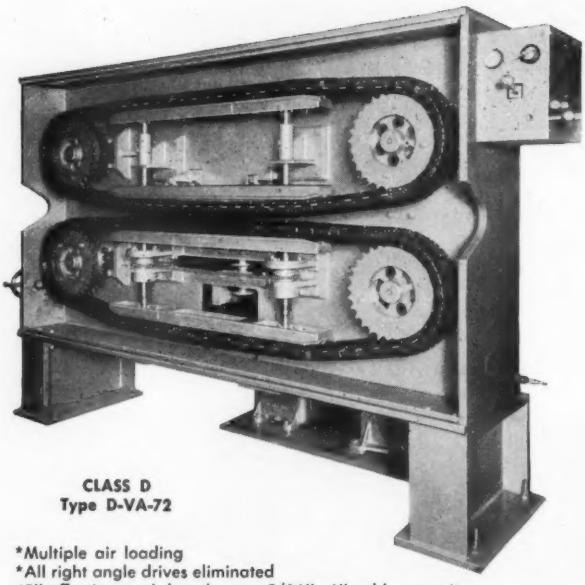
Plants at East Brunswick, N. J., Flemington, N. J., Woodside, L. I., N. Y.

VINYL RESINS — VINYL COPOLYMERS — VINYL COMPOUNDS — SPECIALTY WAXES — HIGH MELTING POINT SYNTHETIC WAXES

*High-Efficiency** CATERPULLERS

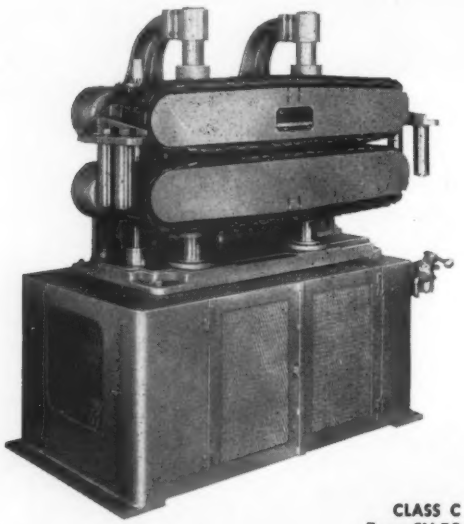
With a complete range of speeds, pulls and capacities.
Choice of horizontal and vertical types.

NEW EFFICIENCIES
Improved drive • Air-Loaded Heads
Non-destructive, controlled gripping
Anti-friction tracks
Greater pulls at lower H.P. input



CLASS D
Type D-VA-72

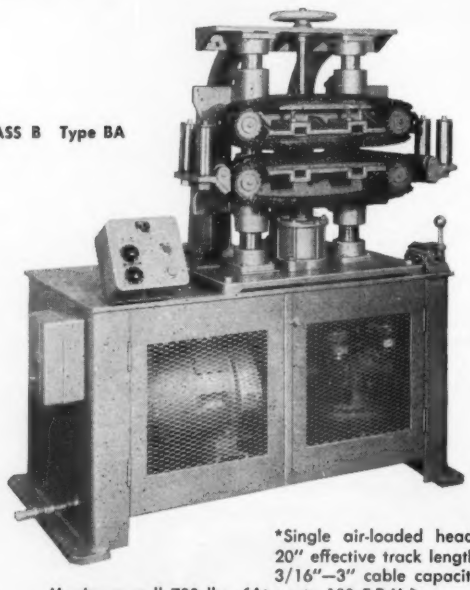
*Multiple air loading
*All right angle drives eliminated
45" effective track length • 3/16"—6" cable capacity
Maximum pull 4000 lbs. (At up to 90 F.P.M.)
650 F.P.M. maximum recommended operating speed
Floating track design • For inputs up to 15 H.P. maximum



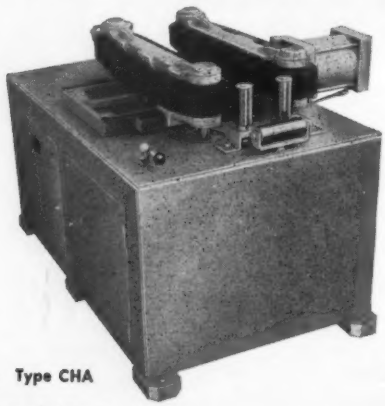
CLASS C
Type CV-DB-40

*Double air-loaded heads
30" effective track length • 3/16"—6" cable capacity
Maximum pull 6000 lbs. (At up to 65 F.P.M.)
500 F.P.M. maximum recommended operating speed
For inputs up to 20 H.P. maximum

CLASS B Type BA



*Single air-loaded heads
20" effective track length
3/16"—3" cable capacity
Maximum pull 700 lbs. (At up to 100 F.P.M.)
500 F.P.M. maximum recommended operating speed
For inputs up to 3 H.P. maximum



CLASS C Type CHA

*Single air-loaded head
Horizontal tread arrangement
30" effective track length • 3/16"—6" cable capacity
Maximum pull 6000 lbs. (At up to 60 F.P.M.)
For inputs up to 15 H.P. maximum

GENERAL INFORMATION

All units are available with readily interchangeable treads with a choice of durometers. Treads can be contoured to match cable diameter to minimize unit pressure. Units are available with or without drives.

ENTWISTLE
Manufacturing Corporation

1475 ELMWOOD AVE., PROVIDENCE 7, RHODE ISLAND

SIMULTANEOUS EXTRUSION OF DIFFERENT COLOR MATERIALS FOR COLOR IDENTIFICATION

THE PERFECT ANSWER TO 2-COLOR EXTRUSIONS

for: Striping Identification
Color Coding
Wire Coating
Wire Insulation

Wire manufacturers with a coding problem will find the solution in this new vertical extruder.

This unit is complete and ready for production. It is designed to give you maximum versatility in operation. By means of a height adjustment and rotation of the top part, and by a spin of the barrel, any setup job becomes routine.

The Model 1250 B can be combined, in tandem, with any standard extruder in operations such as adding contrasting stripes to insulation wire.

MODEL 1250B VERTICAL EXTRUDER

WE WILL MAKE THE EXTRUDER AND DIES TO MEET YOUR SPECIFIC REQUIREMENTS. LET US KNOW YOUR EXTRUSION PROBLEM. WE WILL SOLVE IT AT NO ADDITIONAL COST.

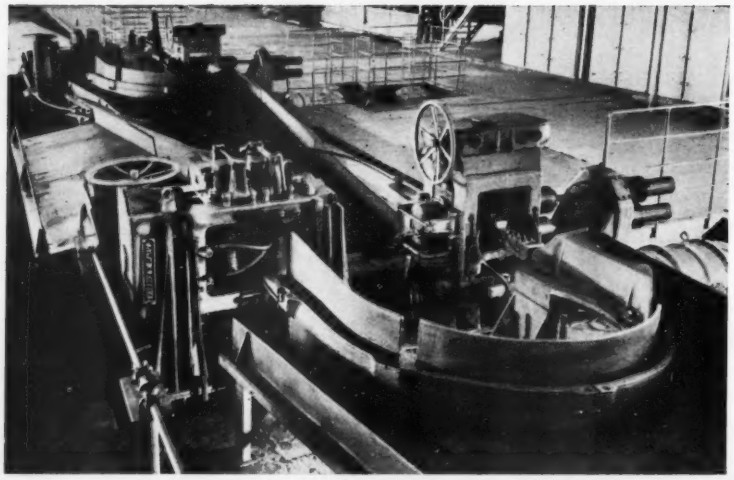
Thermoplastic **Equipment**

Division of THERMOPLASTIC PROCESSES, INC.
VALLEY ROAD • STIRLING, NEW JERSEY

Most Experienced 2-Color Extruding Machine Firm In The World

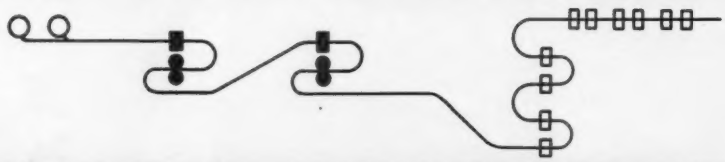
Millington 7-1003 • Mitchell 3-4600 Nwk. • COrtland 7-6220 N. Y. C.

TWO TYPES OF STANDS FOR FINISHING LINES OF M & N WIRE ROD AND SMALL SECTION ROLLING MILLS

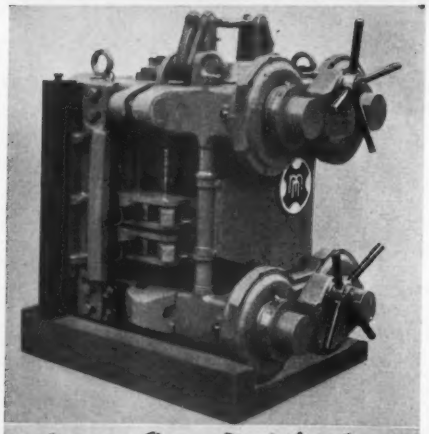


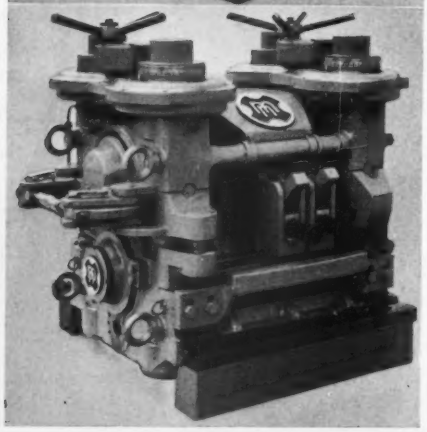
DOUBLE STANDS EQUIPPED WITH HORIZONTAL AND VERTICAL ROLLING UNITS OF A **M & N** ROD FINISHING MILL

Speed increasing from stand to stand small loops - no twisting of bars - continuous rolling - simple electrical equipment - rolls running in roller bearings.



MOELLER & NEUMANN





M & N FRAMELESS, PRE-STRESSED ROLLING UNIT 260 dia. x 400 mm (10.2" x 15.7") BODY LENGTH

here used as Final Stands of a semi-continuous **M & N** Rod and Small Section Rolling Mill. Same stands can be mounted horizontally and vertically. Rolls running in roller bearings.

DESIGNERS AND BUILDERS OF
Hot and Cold Rolling Mills
Rolling Mill Auxiliary Equipment

Redesigning — Modernizing

MOELLER & NEUMANN LTD.

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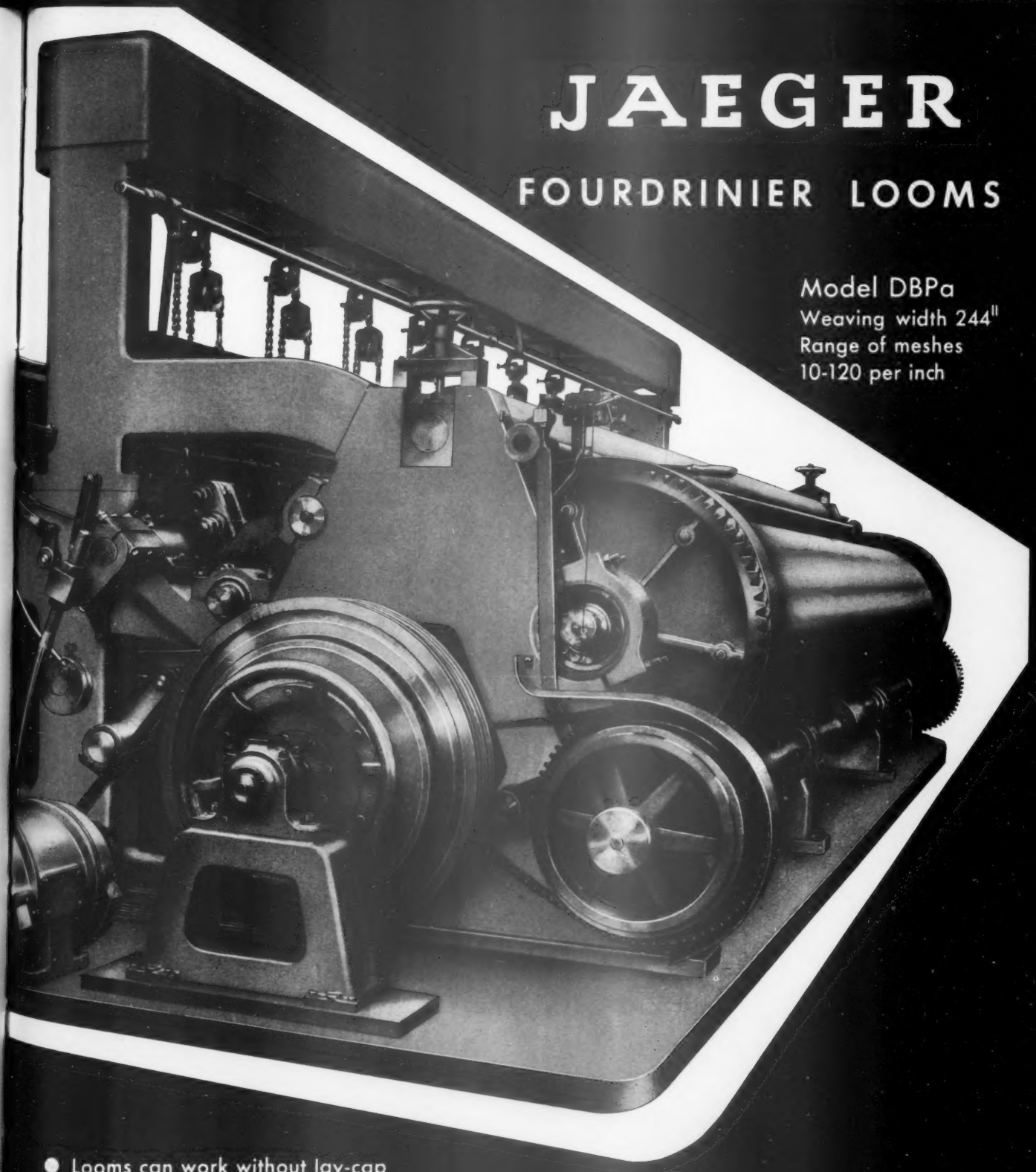
Representative for Canada and the U.S.A.

PAUL REICHER

MACHINERY AND EQUIPMENT LIMITED
600 Eglington Ave., East, Toronto 12, Ont., Canada



JAEGER

FOURDRINIER LOOMS

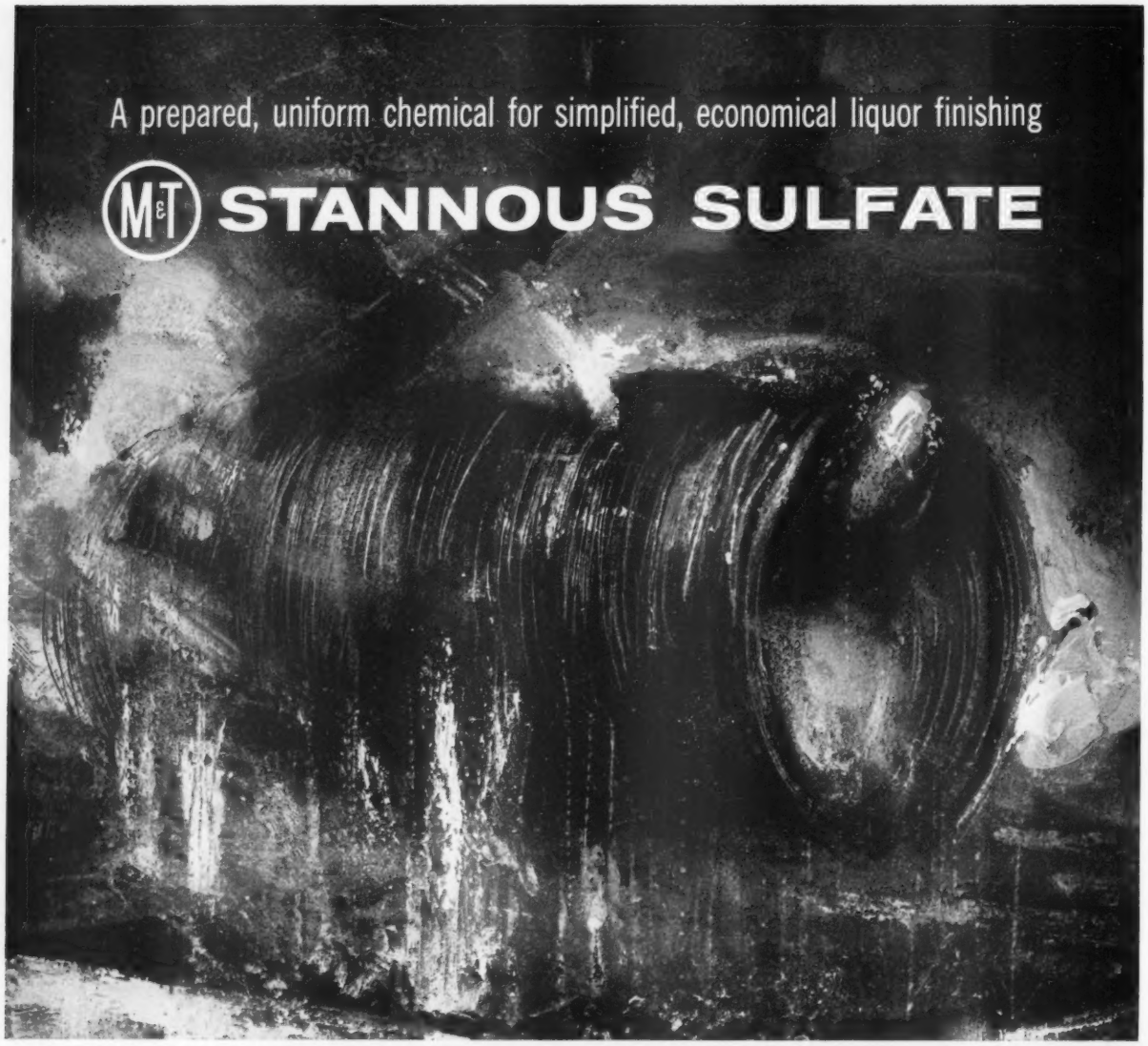
Model DBPa
Weaving width 244"
Range of meshes
10-120 per inch

- Looms can work without lay-cap
- 2-4 driving arms for the lay according to width
- We have a complete line of wire looms and auxiliary machines

Sole Representatives for U.S.A. and Canada

CEDAR-WEST TOOL COMPANY INC.

90 West Street · New York 6, N.Y.



EASES PREPARATION
Standard stock solutions can be made up in advance easily and quickly with M&T Stannous Sulfate, a solid, weighable chemical of specified and constant composition. Tin content is divalent, the only form suitable for iron replacement reaction.

SIMPLIFIES CONTROL
Coating weight and color are adjusted accurately and quickly, using stock solutions of known composition.

IMPROVES QUALITY
Composition of solution is consistent from batch to batch . . . tin alloy coatings are smooth and uniform and of pre-determined thickness.

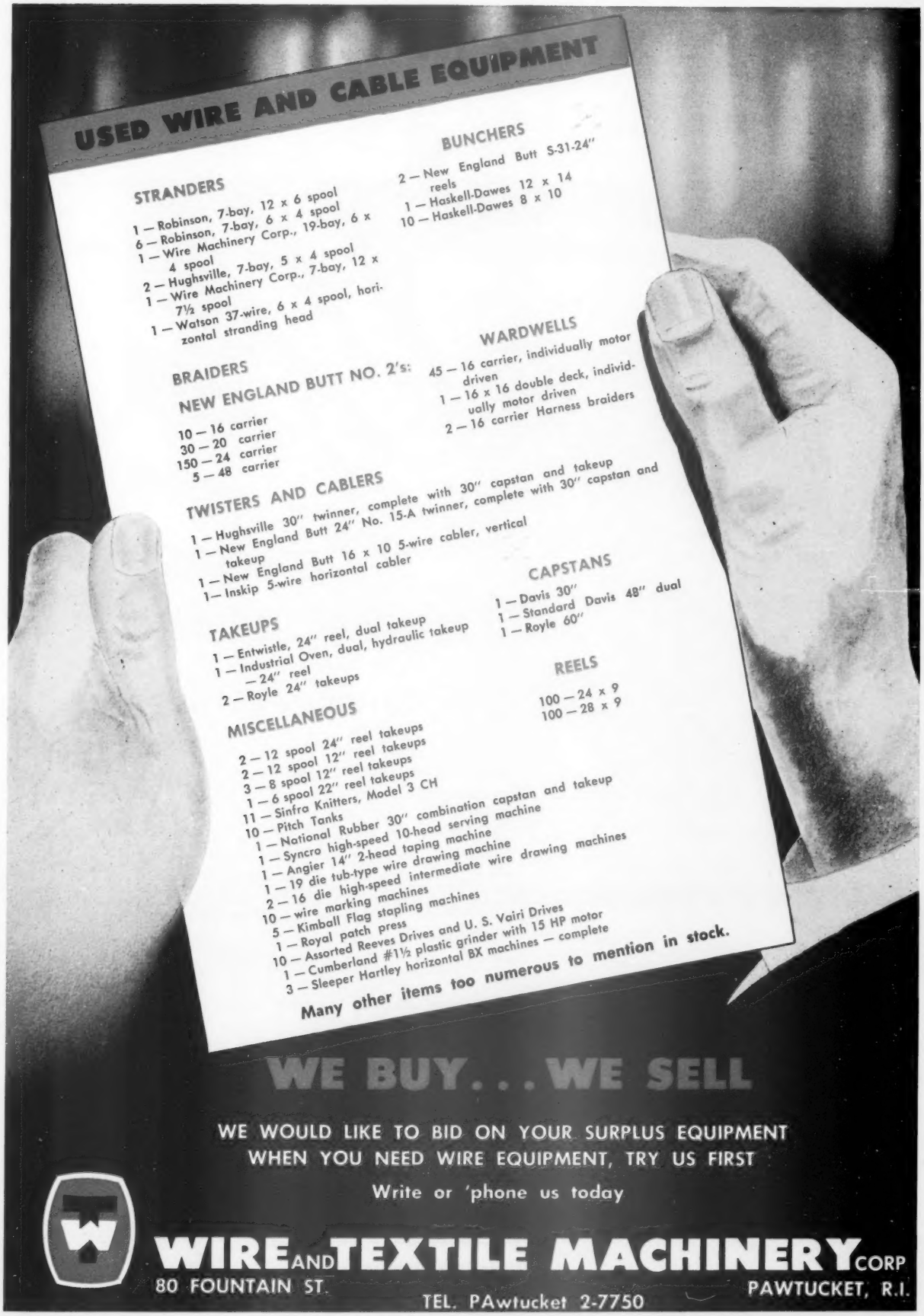
LOWERS COSTS
Standard stock solutions of M&T Stannous Sulfate are more economical to use than solutions prepared from tin metal, copper sulfate and sulphuric acid—save tin and copper, reduce time and labor.

Write for detailed information

M&T Chemicals

Sn Sb P
Si Ti Zr
organometallics and inorganics

METAL & THERMIT Corporation, Rahway, N. J.
In Canada: M&T Products of Canada Ltd., Rexdale Ontario


USED WIRE AND CABLE EQUIPMENT
STRANDERS
1 — Robinson, 7-bay, 12 x 6 spool
6 — Robinson, 7-bay, 6 x 4 spool
1 — Wire Machinery Corp., 19-bay, 6 x 4 spool
2 — Hughsville, 7-bay, 5 x 4 spool
1 — Wire Machinery Corp., 7-bay, 12 x 7½ spool
1 — Watson 37-wire, 6 x 4 spool, horizontal stranding head
BUNCHERS
2 — New England Butt S-31-24" reels
1 — Haskell-Dawes 12 x 14
10 — Haskell-Dawes 8 x 10
BRAIDERS
NEW ENGLAND BUTT NO. 2's:
10 — 16 carrier
30 — 20 carrier
150 — 24 carrier
5 — 48 carrier
WARDWELLS
45 — 16 carrier, individually motor driven
1 — 16 x 16 double deck, individually motor driven
2 — 16 carrier Harness braiders
TWISTERS AND CABLERS
1 — Hughsville 30" twinner, complete with 30" capstan and takeup
1 — New England Butt 24" No. 15-A twinner, complete with 30" capstan and takeup
1 — New England Butt 16 x 10 5-wire cabler, vertical
1 — Inskip 5-wire horizontal cabler
TAKEUPS
1 — Entwistle, 24" reel, dual takeup
1 — Industrial Oven, dual, hydraulic takeup — 24" reel
2 — Royle 24" takeups
CAPSTANS
1 — Davis 30"
1 — Standard Davis 48" dual
1 — Royle 60"
REELS
100 — 24 x 9
100 — 28 x 9
MISCELLANEOUS
2 — 12 spool 24" reel takeups
2 — 12 spool 12" reel takeups
3 — 8 spool 12" reel takeups
1 — 6 spool 22" reel takeups
11 — Sinfra Knitters, Model 3 CH
10 — Pitch Tanks
1 — National Rubber 30" combination capstan and takeup
1 — Syncro high-speed 10-head serving machine
1 — Angier 14" 2-head taping machine
1 — 19 die tub-type wire drawing machine
2 — 16 die high-speed intermediate wire drawing machines
10 — wire marking machines
5 — Kimball Flag stapling machines
1 — Royal patch press
10 — Assorted Reeves Drives and U. S. Vairi Drives
1 — Cumberland #1½ plastic grinder with 15 HP motor
3 — Sleeper Hartley horizontal BX machines — complete
Many other items too numerous to mention in stock.
WE BUY . . . WE SELL
WE WOULD LIKE TO BID ON YOUR SURPLUS EQUIPMENT
WHEN YOU NEED WIRE EQUIPMENT, TRY US FIRST
Write or 'phone us today
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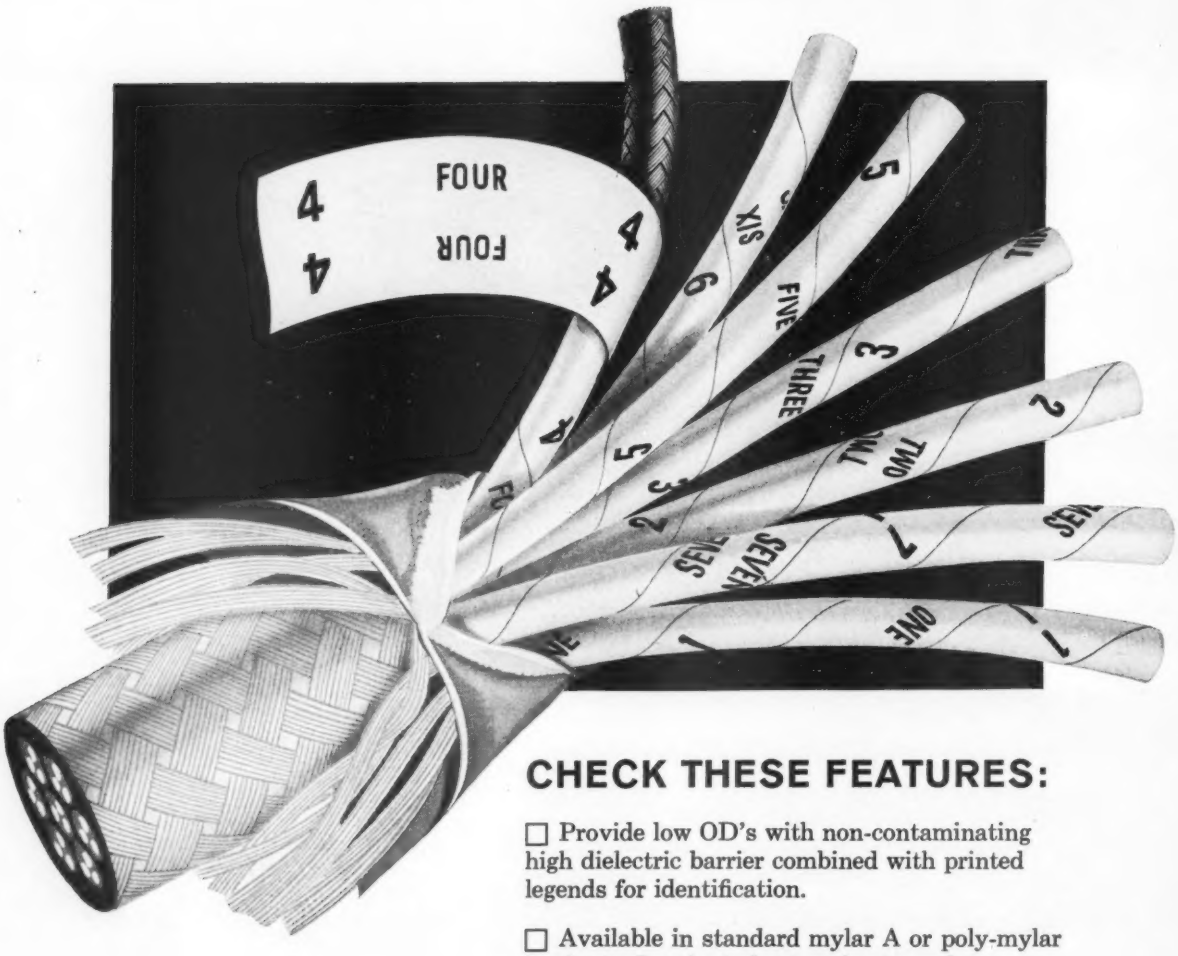
CPS PRINTED MYLAR TAPES



CHECK THESE FEATURES:

☐ Provide low OD's with non-contaminating high dielectric barrier combined with printed legends for identification.

☐ Available in standard mylar A or poly-mylar laminate. Laminate heat seals at overlap—eliminates unraveling, provides moisture seal.

☐ Excellent ink adhesion provides lasting legibility.

☐ Available with one or two color imprint.

☐ Can be printed on either side of tape.

☐ Also available in 3/16″ width for non-serial identification tapes.

☐ Approved for U.S. Navy shipboard missile and control cables.

Forty years of experience supplying marker and identification tapes to the industry:

cotton non woven
woven
treated
untreated
serially printed

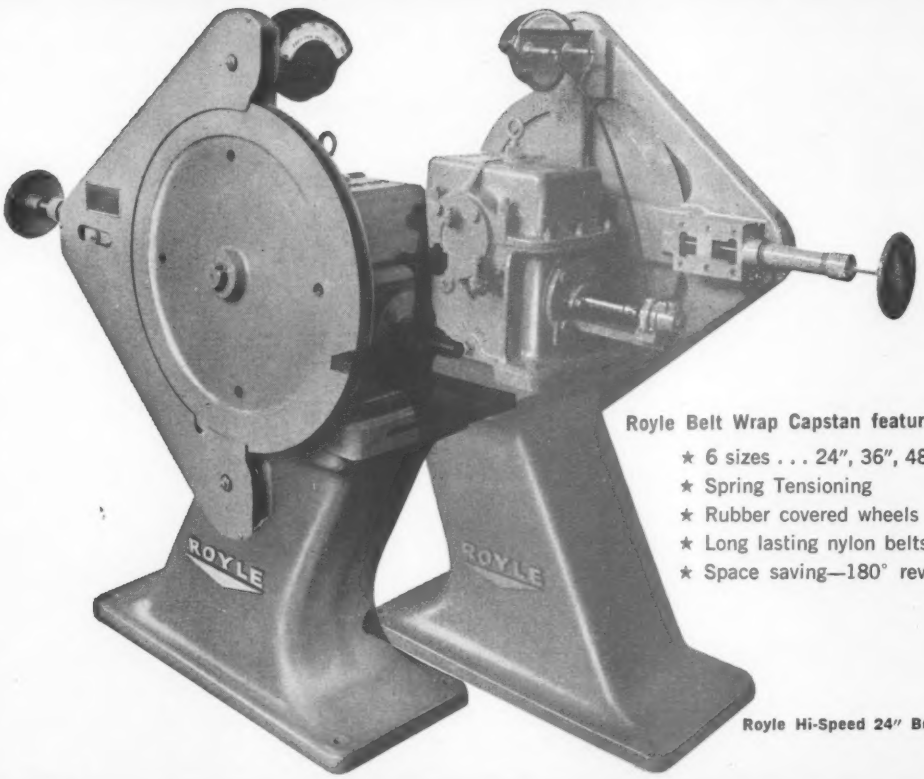
glass woven
treated
untreated
serially printed

CHICAGO PRINTED CPS® **STRING COMPANY**

INDUSTRIAL DIVISION
2300 LOGAN BLVD., CHICAGO 47, ILLINOIS
MANUFACTURED IN CANADA BY RIBBON FABRICS, INC., RIVIERE DES PRAIRIES, QUEBEC

for high speed wire handling

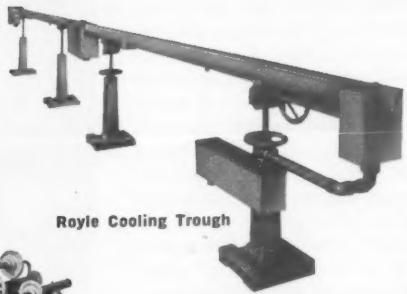
ROYLE CAPSTANS and COOLING TROUGHS



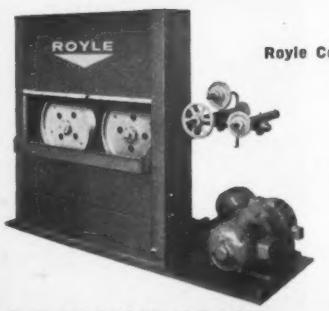
Royle Hi-Speed 24″ Belt Wrap Capstan

Royle Belt Wrap Capstan features:

- ★ 6 sizes . . . 24″, 36″, 48″, 60″, 72″, 84″
- ★ Spring Tensioning
- ★ Rubber covered wheels
- ★ Long lasting nylon belts
- ★ Space saving—180° reversal



Royle Cooling Trough



Royle 20″ Dual Wheel Capstan

Royle Engineered Cooling Trough systems are temperature regulated for exact, controlled rate of cooling.

Royle Heavy Duty Dual Capstans provide extra cooling in limited space. Sizes: 16″, 20″, 24″, 30″, 36″, 48″ and 60″.

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Pioneered the Continuous Extrusion Process in 1880

Home Office, V. M. Hovey, J. W. VanRiper, SHerwood 2-8262. Akron, Ohio, J. C. Clinefelter Co., BLackstone 3-9222. Downey, Cal., H. M. Royal, Inc., TOpaz 1-0371. London, England, James Day (Machinery) Ltd., Hyde Park 2430-0456. Tokyo, Japan, Okura Trading Company, Ltd., (56) 2130-2149.

John Royle & Sons, 10 Essex Street, Paterson 3, N. J.

Please, send me full information about Royle's Wire Handling Equipment.

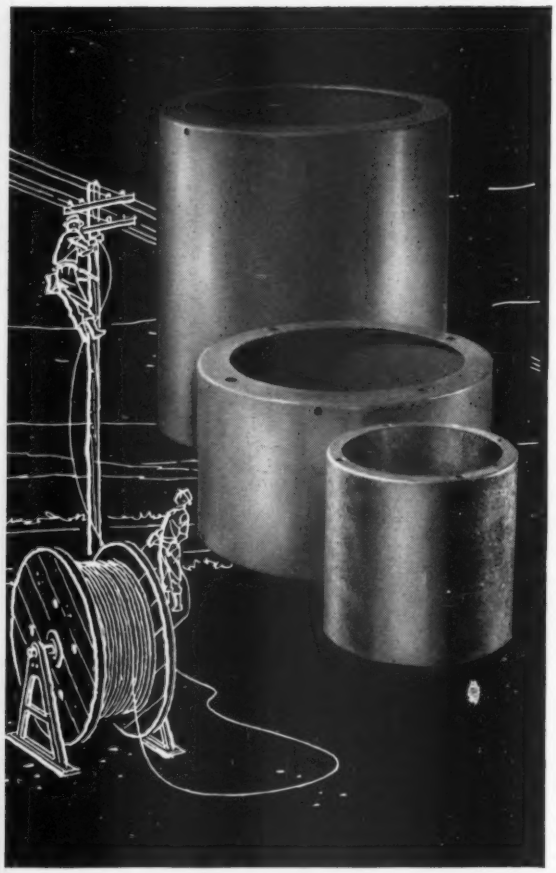
Name_____ Title_____

Company_____

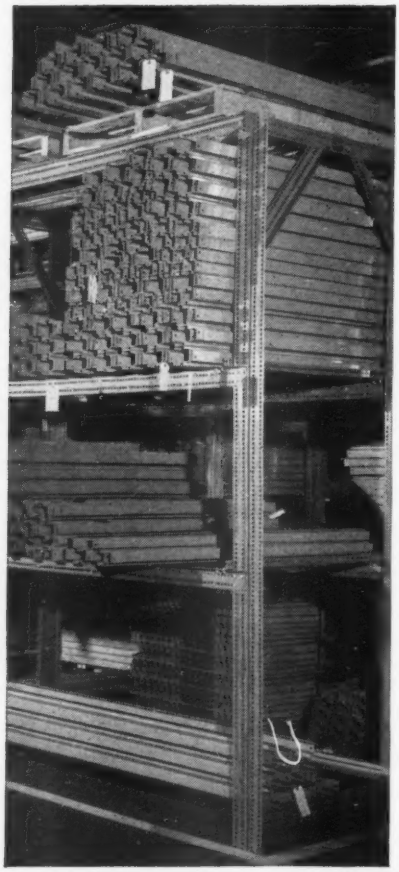
Street_____

City_____ Zone_____ State_____

STANDARD REPUBLIC MATERIAL HANDLING PRODUCTS SOLVE STOCK, STORE, SHIP PROBLEMS

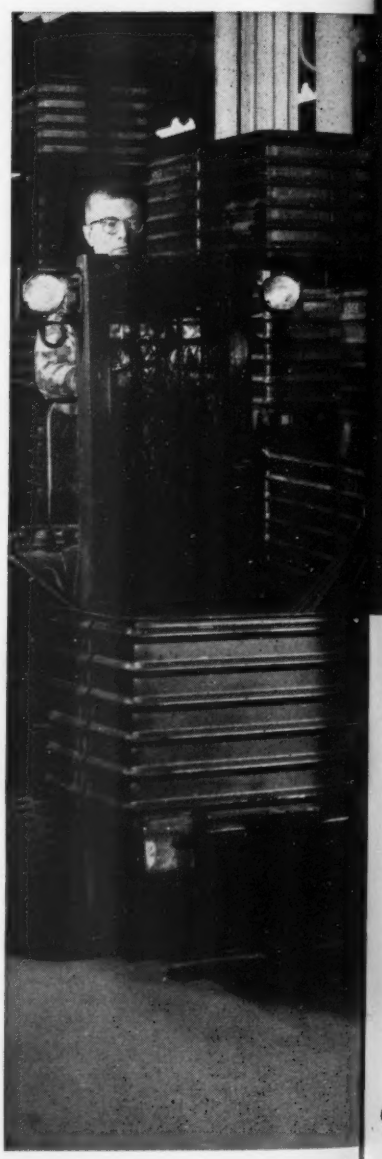


REPUBLIC FLANGED STEEL TRAVERSES save time, labor, money. Simple four-way assembly; no special tools required; long, trouble-free service. And Republic Steel Traverses are reinforced where it counts—at flange base and bolt holes. This makes possible the use of lighter gage steel, reduces weight 20%, with highest strength-to-weight attainable. Available in either plain, painted, or hot dip galvanized finish. Flange width, and bolt and drain holes furnished to your specification. Choose from the industry's most complete line. Over 100 sizes ranging from 12″ to 56″ diameter—6″ to 48″ lengths. Immediate delivery.



REPUBLIC METAL LUMBER® provides faster, stronger, safer framing. Ideal for erecting shop-built, tailor-made storage facilities for hard-to-handle stock-and-store materials. Erection is easy. Simply measure, cut, assemble with self-locking bolt and nut fasteners. METAL LUMBER is fabricated from cold rolled steel to assure uniform physical properties, and high strength-to-gage ratio. Bonderized after fabrication for complete protection of all exposed parts. Available in two gages, two widths, in standard bundles of either 10- or 12-foot lengths, complete with fasteners. Write for more information.

STANDARD REPUBLIC MATERIAL HANDLI UNITS save time in stack, store, ship ope tions. Reduce storage space requireme Standard Republic Boxes feature heavy-d stacking brackets and corrugated constr tion that combine to deliver long, effici service at low per-year cost. Four-way f channels simplify handling in restricted spa A Republic Material Handling specialist work with you. Call or write today.



REPUBL cal so especi does n design wire. F by cra

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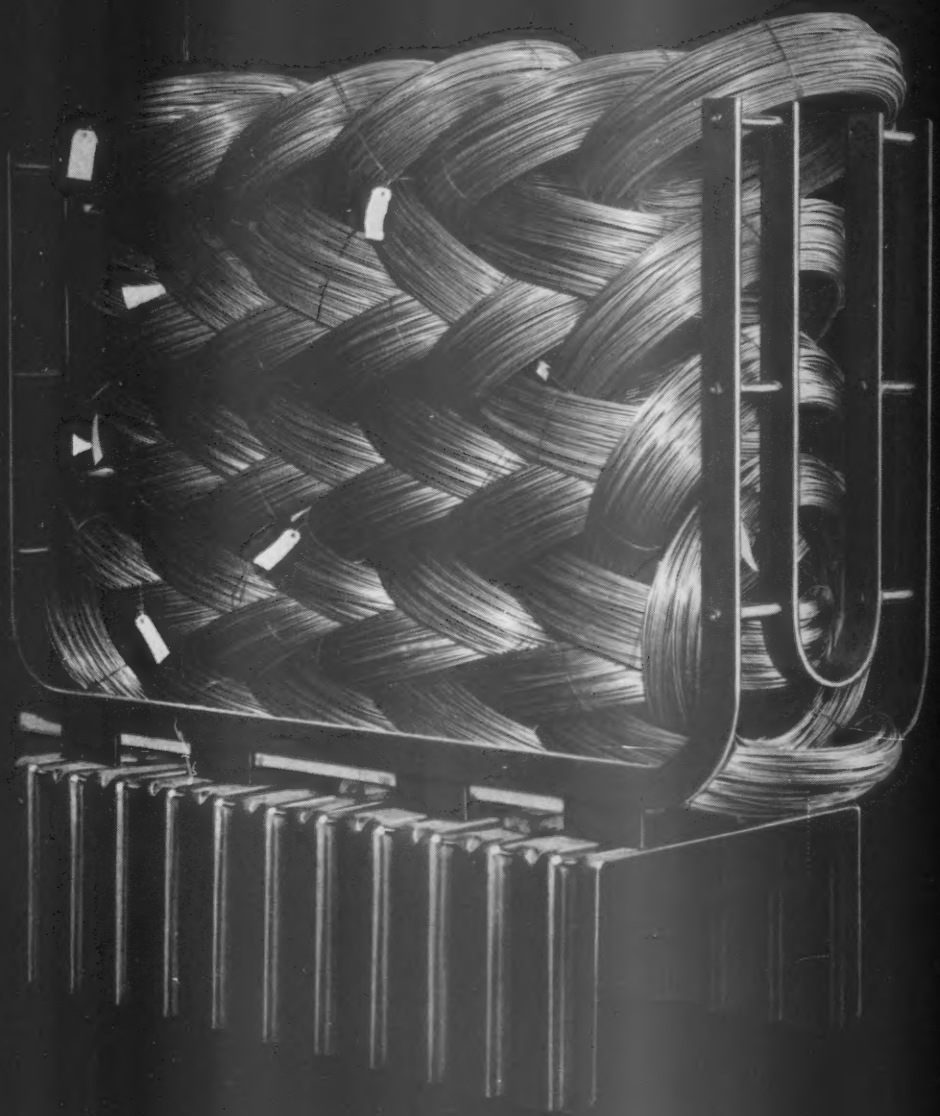

REPUBLIC STACK 'N STORE UNITS provide a practical and economical solution to the problem of wire handling. These units are especially adaptable to bulk material, such as coiled wire, that does not require the use of completely enclosed sides. Specially designed "U" shape superstructure permits high stacking of coiled wire. Fully loaded superstructures are handled quickly and easily by crane. Or superstructures may be placed on skids and the entire unit readily moved to store-and-ship areas by lift trucks. Republic Stack 'N Store Units save valuable floor space, eliminate cluttered aisles, reduce handling time.

If you have a material handling problem, call your Republic-Berger representative. Republic Material Handling specialists will work with you, will recommend the right standard units to do your job right. Call or write today.

REPUBLIC STEEL

World's Widest Range

of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION

DEPT. WP-9534-R

1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on the following products:

- ☐ Republic Flanged Steel Traverses
- ☐ Republic Material Handling Units
- ☐ Republic Stack 'N Store Units
- ☐ Please have a representative call

☐ METAL ☐ LUMBER

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

EXHIBITS AT THE ANNUAL CONVENTION

Open November 13-16, 1960, La Salle Hotel, Chicago, Illinois

Arrangements have been made this year for space in the hotel where wire equipment and supplies will be exhibited. This innovation we hope will be highly successful for the exhibitors and satisfactory to mill men attending the Convention. All are invited and urged to call upon the Exhibitors in the Illinois Room on the Mezzanine Floor.

Opens SUNDAY, NOV. 13, at 5:00 P.M.

Following is a partial list of the companies exhibiting. Others who have indicated interest will be taking exhibit space and will be on hand to greet you and explain their processes and products.

Acrometal Products, Inc.
Minneapolis, Minn.
Spools, Reels and Wire Processing Equipment

American Feldmuehle Corp.
New York, N. Y.
Ceramic Guides and Blocks

Associated American Winding Machy., Inc.
Chicago, Ill.
Wire Winding Equipment

Avery Baird Company
Cranford, N. J.
Deburring Machinery

Behr Machy. & Equipment Corp.
Rockford, Ill.
Cold Heading Machinery

Bemol, Inc.
Boston, Mass.
Lubricants

Catalytic Combustion Corp.
Detroit, Mich.
Fume Elimination Equipment

Daystrom, Inc.
Weston Instruments Div.
Newark, N. J.
Diameter Control Equipment

Dow Corning Corp.
Midland, Mich.
Insulation Materials

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New York, N. Y.
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Heany Industrial Ceramic Corp.
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Spools

Mettler Machine Tool Inc.
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Tote Boxes and Plastic Spools

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Wire and Wire Products
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THE WIRE ASSOCIATION

Richard E. Brown, Executive Secretary

453 Main Street **Stamford, Conn.**

MODERNIZE YOUR PREHEATING PROCESS WITH A

WALCO All Electric WIRE PREHEATER

Patent #2931891
and other patents pending

Now 3 MODELS

For copper or aluminum wire sizes #24 to #0, depending upon temperature and speeds required.

- Continuous wire pre-heating
- Uniform heat • Compact
- Portable • Easy to install
- Increases Production
- Temperature control
- Indicating Gauge
- Positive heat control at any given speed
- Non-Oxidizing • Infinite heat range with Safety of operation
- Synchronizes with other equipment. No spoilage
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- Rotating parts equipped with heavy duty ball bearings
- Eliminates temperature guess work
- Eliminates constant flame vigilance
- Eliminates hazardous gas lines
- Adjustable to line up with all make and size extruder heads
- Automatic "On" and "Off" operation

MODELS: W-7½ • W-15 • W-22

220/440/550 Volt, 1 Phase, 60 Cycle

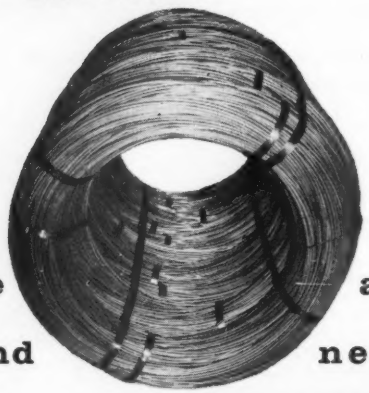
Modifications & Accessories

A) Voltmeter, Ammeter & Pilot Light Panel
B) Front Enclosure Over Wheels
C) 50 Cycle
D) Multigroove Wheels
E) 3 Energized Wheels (in lieu of 2 standard wheels)
F) Automatic Temperature Control
G) Saturable Core Reactor Type Transformer

Specially designed models available for all wire pre-heating applications.

WALCO ELECTRIC COMPANY
131 Blackstone St., Providence, R. I.

MARATHON STEEL WIRE



For all specialized steel wire applications, particularly for rollers, balls and needles in anti-friction bearings, Marathon offers advantages derived from more than 150 years experience in specialty steels. Marathon assures best workability and uniform quality of steel wire of all types —alloy, high speed, stainless, tool, heat resistant—available straight or in coils. Specify Marathon, too, for high quality forged alloy steel rolls for flat cold rolling. Contact us and expect immediate attention to all inquiries and individual problems.

MARATHON

SPECIALTY STEELS, INCORPORATED

A Division of Deutsche Edelstahlwerke A. G., Krefeld, West Germany DEW 375 Park Avenue, New York 22, N. Y.

Spiralwrap Machine Handles Coils up to 107" O.D.

Ludlow's UW-16 Spiralwrap Machine offers a greater coil size capacity than any other machine of its type. With a coil traverse of 15½", the UW-16 wraps coils from 24" to 107" O.D.

The UW-16 is *custom designed* to meet your exact range requirements. Conformation of the machine to the product is achieved by simply "dialing" the coil specifications.

Bottom-wrap design permits wrapping of both heavy and lightweight coils with a tight, safe wrap. The larger capacity of the machine permits larger rolls of paper, minimizing stops for paper loading. The UW-16 is the first machine designed especially for the extreme size of coils now required by industry.

The UW-16 joins a complete line of Ludlow spiral-wrapping equipment. Spiralwrapping machines now range in gap width from 4" to 16" . . . Accessories include a variety of special devices and papers as indicated below:

1. DEVICES for folding, edging and tension control.

2. CREPED WRAP includes regular and waxed kraft, asphalt and non-staining laminated, reinforced, VPI and non-asphaltic neutral (for anti-rust), and polyethylene coated or laminated.

3. PRINTED with your name or trademark in one or more colors if desired.

4. RODS and straight lengths as well as coils can be wrapped better at less cost on Ludlow spiralwrap machines.

When writing for information, be sure to describe the nature and dimensions of the product you wish to wrap. Trained Ludlow technicians are always available for an on-the-job analysis of your packaging problems.

PECIFICATIONS: UW-16 BOTTOM WRAP MACHINE
OWER: 220V/440V, 3 Phase, 60 Cycle Standard wiring
AFETY FEATURE: 110V controls • **SHUTTLE MOTOR:** 1½ h.p.
EED ROLL MOTOR: ½ h.p. • **GUIDE ROLL MOTOR:** ½ h.p.
ith reduction gear • **HEIGHT:** 156" (based on 107" O.D. coil)
ASE: 66" wide x 63" long • **WEIGHT:** 5000 lbs. • **PAPER ROLL**
IZE: 14" diameter x 5" wide; 1⅞" core • **MAX. WRAPPING**
AP. PER ROLL: 107" O.D. coil (80" I.D. x 15" Traverse)

See us at our Convention Suite at the
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Bud Cordts will also be on hand to greet you and discuss your requirements for Ludlow Jute Electric Yarn and Roving.

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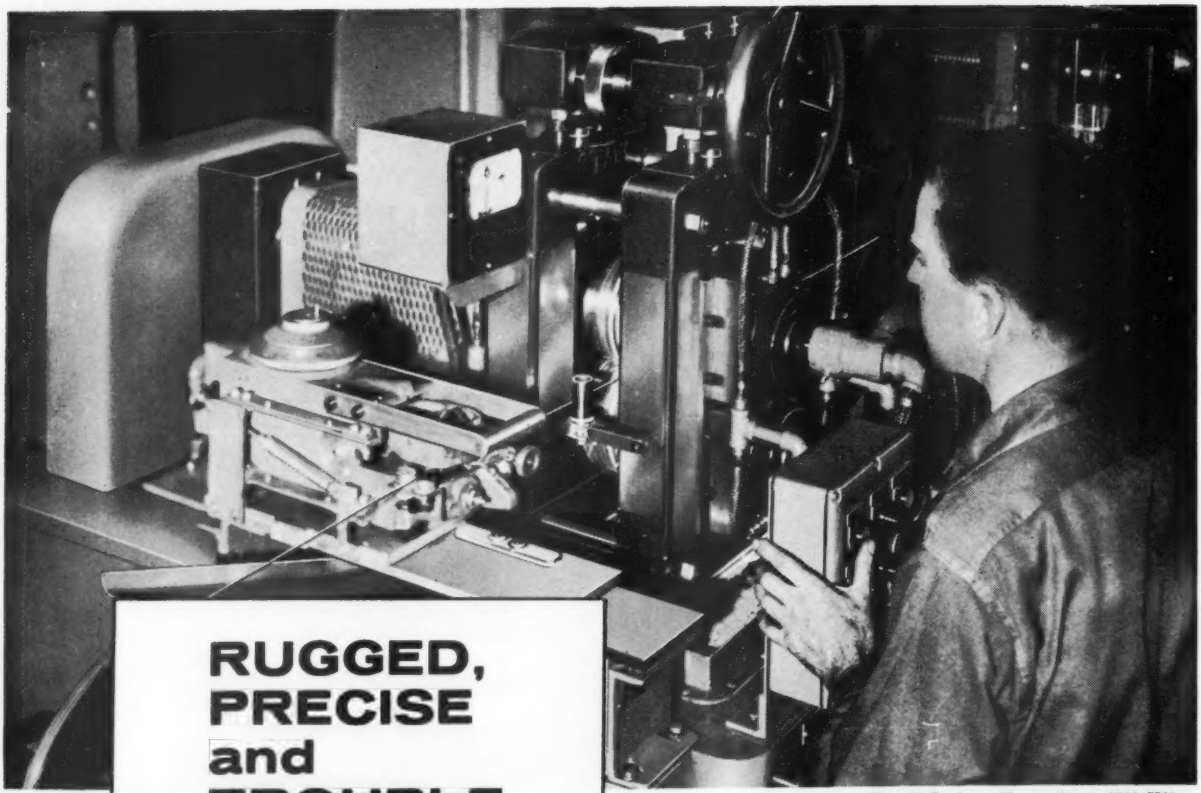
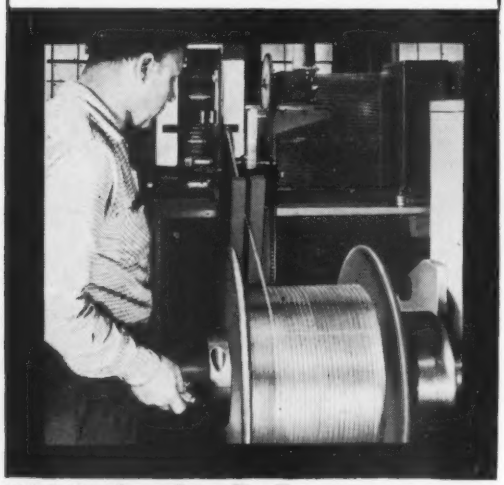


6" x 4" Tandem mill operating at 1500 FPM on high carbon steel at Page Steel Division—ACCO.

RUGGED, PRECISE and TROUBLE FREE



1000 lb. traversing recoiler on 8" x 5" tandem line at Kagan Dixon Wire Corp.

STANAT WIRE FLATTENING MILLS

Stanat mills are designed to consistently give you extremely close tolerances combined with high speed production.

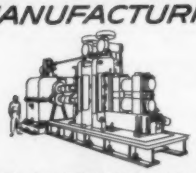
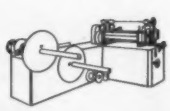
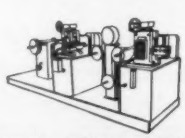
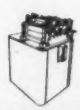
Simplicity of design insures minimum maintenance and frequently permits one man operation.

All Stanat mills include such quality features as completely enclosed permanently lubricated worm gear screwdowns; fully adjustable traversing recoiler; herringbone drive; anti-friction bearings at all critical wear points.

Stanat single and tandem wire flattening mills are available in sizes up to 10" roll diameter either as completely self-contained package units or as individual components for erection at your plant.

STANAT
MANUFACTURING CO., INC.

500 SHAMES DRIVE WESTBURY, L. I., N.Y.
IN EUROPE: STANAT-MANN, ESSEX, ENGLAND

MFR'S OF ROLLING MILLS, GANG SLITTERS, WIRE FLATTENING MILLS, ROLLER LEVELERS AND BULL BLOCKS

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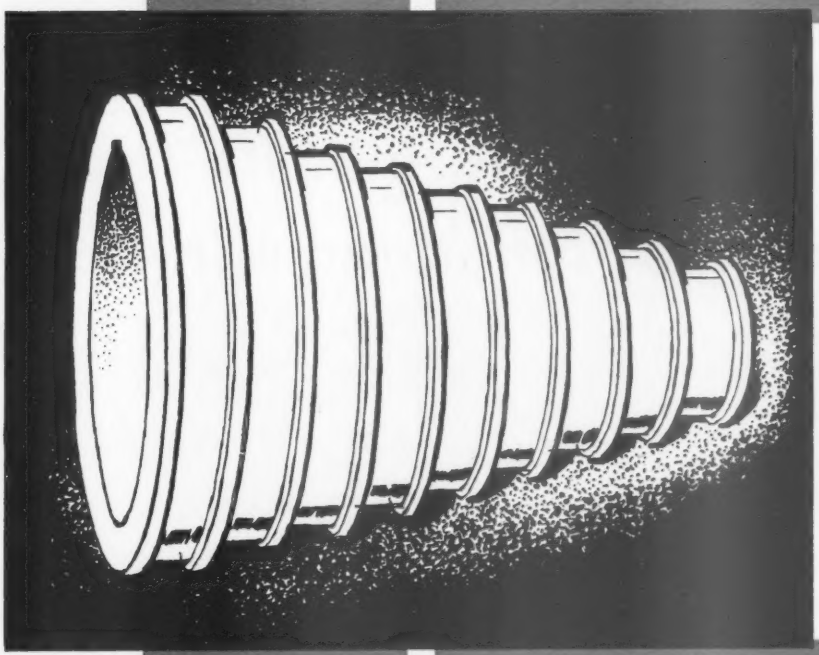

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products for
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CORPORATION**

11 WEST 42nd STREET, NEW YORK 36, N. Y. PENNSYLVANIA 6-9751

"Not one failure in 10 years with USS American springs"

Mr. Lee Dunn, Sales Manager of Walter Balfour & Co., Inc., tells why American Steel & Wire Springs are used in Balfour Doc-Port Rolling Steel Pier doors.

"The springs in our doors have to be exceptionally tough and dependable," says Mr. Dunn. "The performance of the doors is dependent upon the quality of the springs. The springs must act uniformly over their entire length because the doors must be perfectly counter-balanced at every point of travel. Springs of the same wire diameter and coil diameter *must* have identical characteristics. In the ten years we've been using American Steel & Wire springs, we've never experienced a failure.

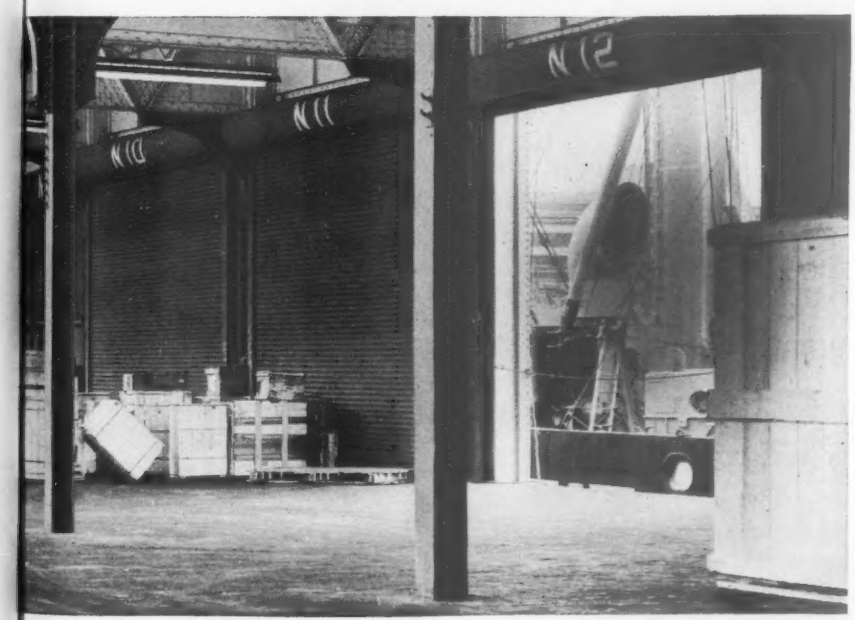
"Most of the USS American springs used by the Balfour Company are made from 7/16" cold wound wire. In the larger steel pier doors there are actually multiples of our helical torsion spring sizes . . . 3/8", 9/16", 1/2", and 13/32". Springs are nested one within another, each spring mounted on shaped cast anchors which are fixed to a single torsion rod, so that the springs are equally and simultaneously loaded."

When springs are your special problem, come to American Steel & Wire. Our Spring Engineering Service has a solid reputation for coming up with the right answer at the right time. They'll be glad to pitch in on your problem. Give us a call today, or write American Steel & Wire, Dept. 0407, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

USS and American are registered trademarks

Cold wound springs in Balfour doors are placed inside steel cylinders and fixed on each end to anchors that prevent internal collapsing of the springs at contact points.

Balfour doors are exposed to heavy wind loads and salt water spray, but they can take it—and so can the USS American springs.



3000 lbs. ride on each USS American spring assembly every time these big 18' x 24' Balfour Pier doors open and close. It takes rugged, long-lasting springs to stand up under this kind of punishment.

American Steel & Wire
Division of
United States Steel

Columbia-Geneva Steel Division San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Alabama, Southern Distributors
United States Steel Export Company, Distributors Abroad

This mark tells you a product is made of modern, dependable Steel.

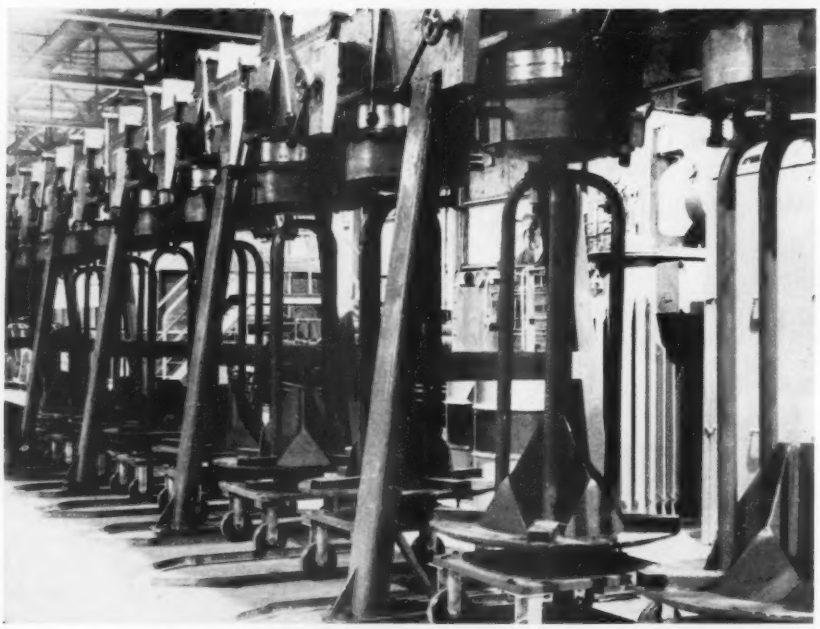
Albert

WIRE TAKE-UP UNITS TYPE AWH 15

With overhead suspension take-up pulleys

are the dramatic new breakthrough in producing

wire coils of heavy weight without twisting



Available in independent machines or multiple units.

Independent take-ups can be used on the exit side of wire drawing machines to provide continuous finished coils of exceptionally heavy weight.

In multiple form, these units are particularly suitable for patenting and galvanizing plants.

FRIEDR. ALBERT, BREDENBRUCH (West.) WESTERN GERMANY

Please direct inquiries to:

PAUL REICHER MACHINERY and EQUIPMENT, LTD.

600 EGLINGTON AVE., EAST TORONTO 12, ONT., CANADA

You are cordially invited
to visit with us at the

La Salle Hotel
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November 14 — 17, 1960
Visit our Suite

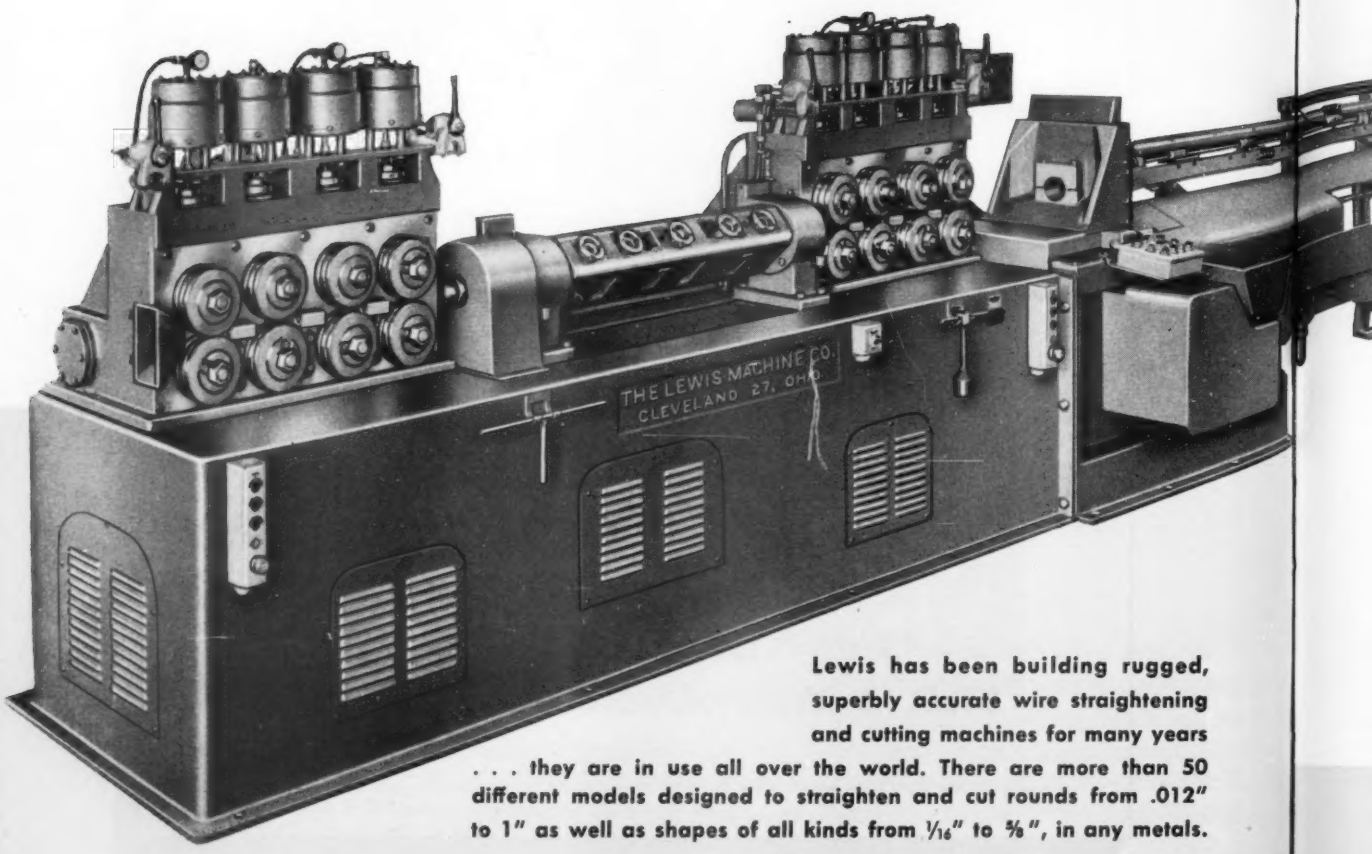
•

THE LEWIS MACHINE COMPANY
and their representatives
PENN MACHINERY COMPANY
STEEL & WIRE MACHINERY COMPANY

meet the ALL NEW

LEWIS "TRAVEL CUT"

WIRE STRAIGHTENING and CUTTING MACHINE



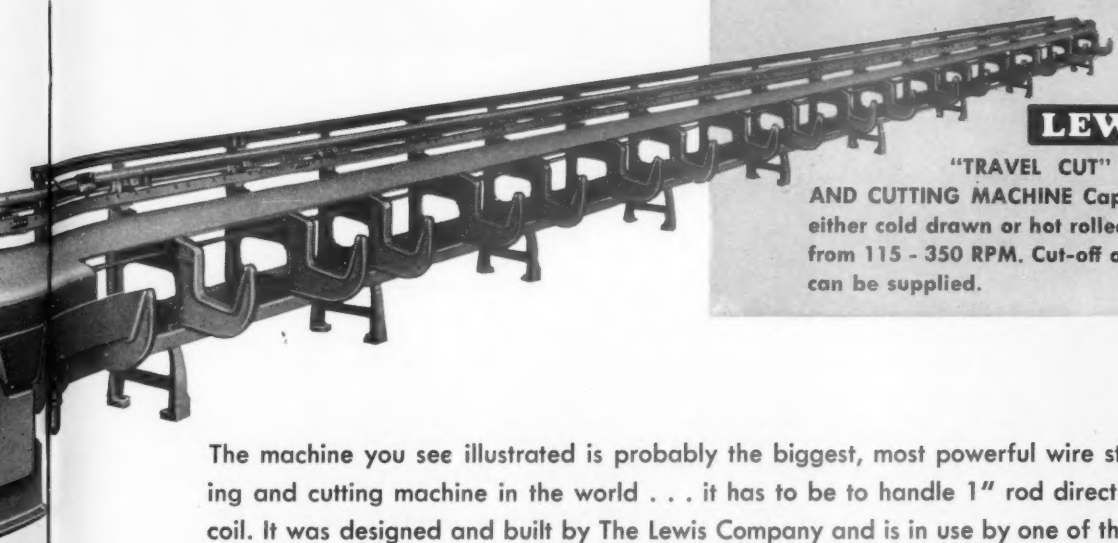
Lewis has been building rugged, superbly accurate wire straightening and cutting machines for many years . . . they are in use all over the world. There are more than 50 different models designed to straighten and cut rounds from .012" to 1" as well as shapes of all kinds from 1/16" to 5/8", in any metals.

THE LEWIS MACHINE COMPANY

A DIVISION OF CURTIS MFG. CO.

3441 East 76th Street, Cleveland 27, Ohio

... handles 1" rod, FROM THE COIL



LEWIS No. 12-FA

"TRAVEL CUT" WIRE STRAIGHTENING AND CUTTING MACHINE Capacity ½" to 1" dia., in either cold drawn or hot rolled rod. Eight feed speeds from 115 - 350 RPM. Cut-off or straightener units only can be supplied.

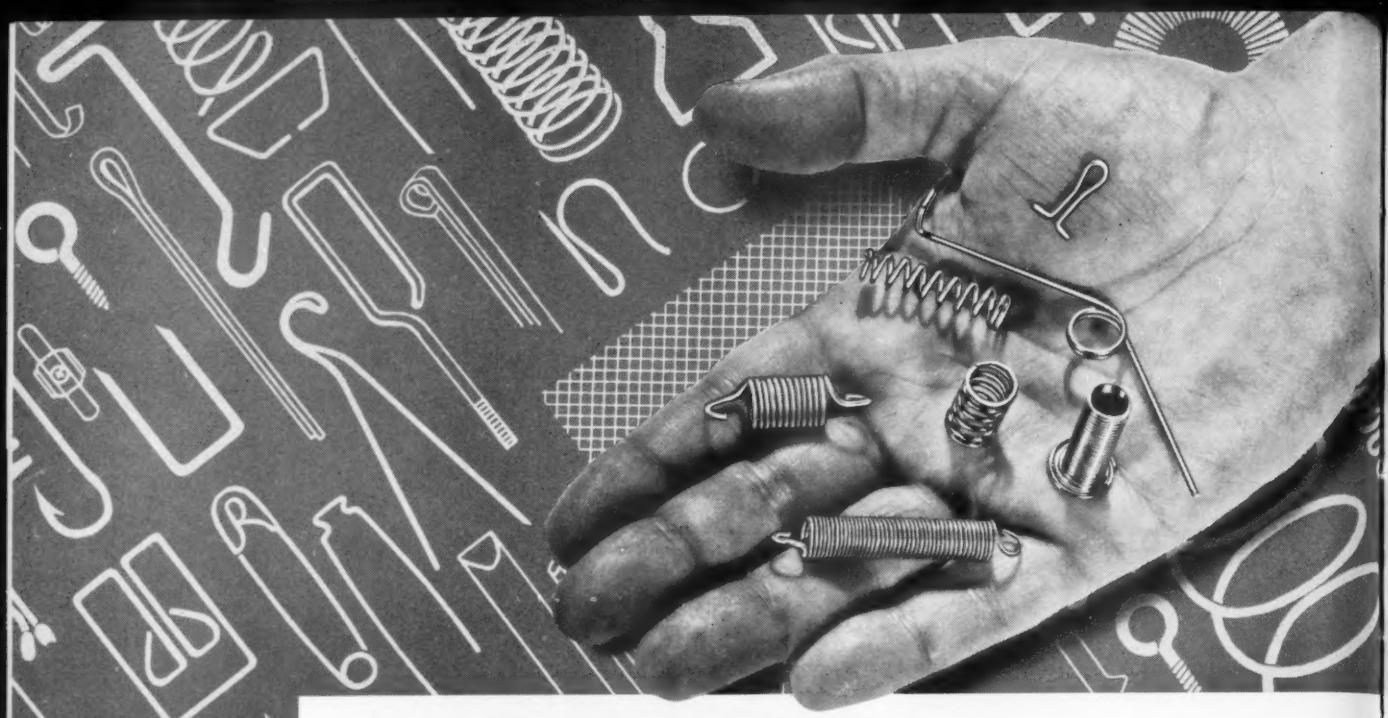
The machine you see illustrated is probably the biggest, most powerful wire straightening and cutting machine in the world . . . it has to be to handle 1" rod direct from the coil. It was designed and built by The Lewis Company and is in use by one of the world's leading steelmakers.

The Lewis No. 12-FA "Travel Cut", to give it the proper designation, is a giant in the machine world being 85 feet long and weighing over 46,000 pounds . . . it has to be big and tough because it has a big job to do.

Tapered Roller TIMKEN BEARING EQUIPPED

INCREASED PRODUCTION WITH LESS SCRAP OVER DRAW-BENCH METHOD

We'll be pleased to send you our brochure showing the Lewis line of wire straightening and cutting machines. If you have any special problems in this field, our Engineers will be happy to co-operate with you in working out a solution.



PAGE SPECIAL HB
Can Cut Wire Costs Up to 60%

You can use PAGE *Special* HB for many jobs where music wire has always been specified—and save up to 60% on your wire costs! Tensile strengths of *Special* HB, which is available in the size range .020″ diameter to .162″ diameter (bright finish and galvanized), approach those of music wire in all sizes—and in sizes .090″ diameter and coarser equals them! Here are some typical examples:

SIZE	STANDARD HB	SPECIAL HB	MUSIC WIRE
.1620	219,000 min.	**249,000 min.**	249,000 min.
.1350	227,000 "	**258,000 "**	258,000 "
.0800	244,000 "	**276,000 "**	282,000 "
.0200	310,000 "	**320,000 "**	350,000 "

If you now use music wire, or have been prevented from using it because of its high cost, it makes sense to investigate PAGE *Special* HB.

WHATEVER your wire requirements, you can count on PAGE quality from America's leading special-purpose wire mill. PAGE will give you the tensile strength, ductility, finish, tolerance and other properties you require in a wide range of manufacturers wire items—including corrosion-resistant ACCO *Aluminized* Wire and wires of special shapes.

Write for details. Write us at Monessen, Pa., for Booklet **DH-107a** for the story on PAGE *Special* HB—or for information on other wires.

ACCO

PAGE MANUFACTURERS WIRE

Page Steel and Wire Division • American Chain & Cable Company, Inc.

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE — *the source for answers to wire problems*

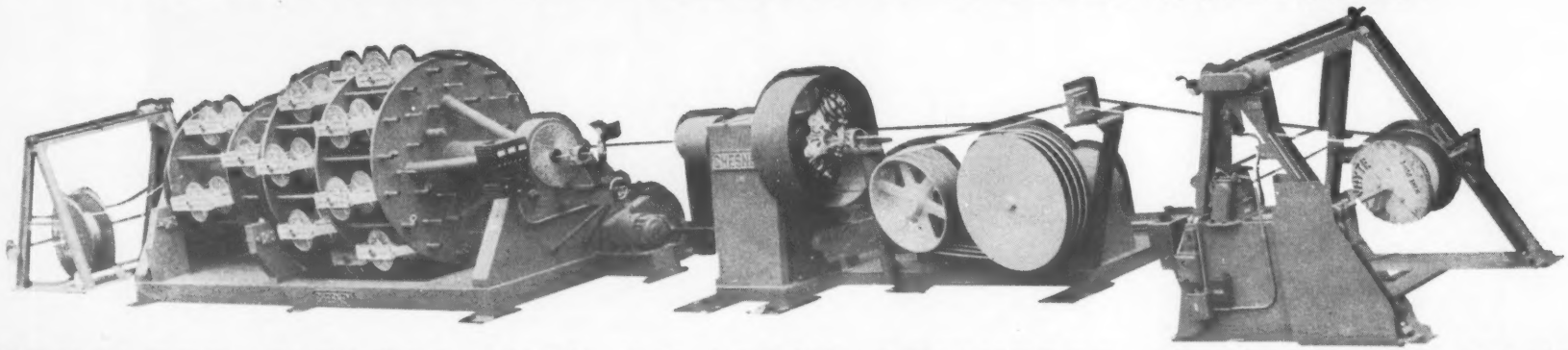
new from...

Chesney Tool and engineering corp

24 CRADLE PLANETARY CABLER

The most modern cabler ever built has been developed by Chesney Tool & Engineering Corp. specifically for cable manufacturers supplying short runs for missile requirements as well as long commercial runs. Provision is incorporated for tandem sections to operate in unison.

NEW!! PLANETARY CABLERS & SPECIAL MACHINERY



COMPLETE CABLERS SUCH AS ABOVE DELIVERED IN 90 TO 120 DAYS

- Completely loaded, set up and operating in 1 hour or less by 1 man.
- Designed for high speed and rugged use. Long life and minimum maintenance assured.
- New electronic drive system features push button control box complete with tachometers and speed selectors for lay range, tape lay and cage-speed.
- Cagespeeds up to 140 RPM.
- Lay ranges from 1" to 36" ratio, or greater as required.
- Gimbal feed tubes handle up to 1¼" conductor. Cables to 3" diameter. New design incorporates double-safe cam lock.
- Capstan wheel or caterpillar capstan available. (Note: Unique features in caterpillar eliminate flattening of cable.)
- Electronic or mechanically adjustable drive systems available.
- Special high speed taping head with combination infinity adjustable, tape roll holder and approach idlers. Accurate, sensitive tension brake equalizes tension from start to finish.
- Fast loading gimbals with built-in tension brake and spool pusher eliminate noise from "side slap."
- 16" diameter by 12" reels. Will handle 8 of 24" dia. x 12 traverse. Also equipped with 20 jute posts or rigid reel shafts in addition to 24 planetary cradles.
- Take-up with leveler and payoff units quickly and easily set up (push button operated).

Call us for your specific requirements. Complete brochure or demonstration on 16mm color & sound film shown on request

other Chesney products

- Barrel Stranders and Twining Machines.
- High Speed Spoolers.
- Jacketing Equipment.
- Heavy Spool Dollies.
- Quality Steel Spools.
- Any and all special equipment designed and built to specifications.

CALL OR WRITE FOR OUR SPECIAL BROCHURE

Consult us for your specific requirements. Our Engineering Department can solve your problem and quote prices on short notice.

Chesney Tool and engineering corp

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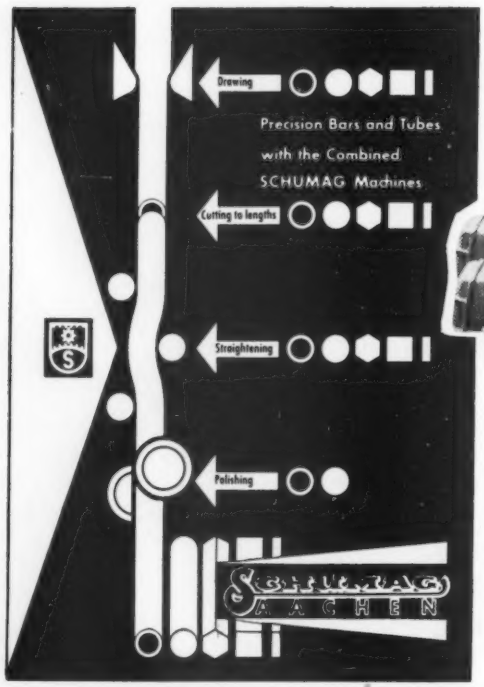
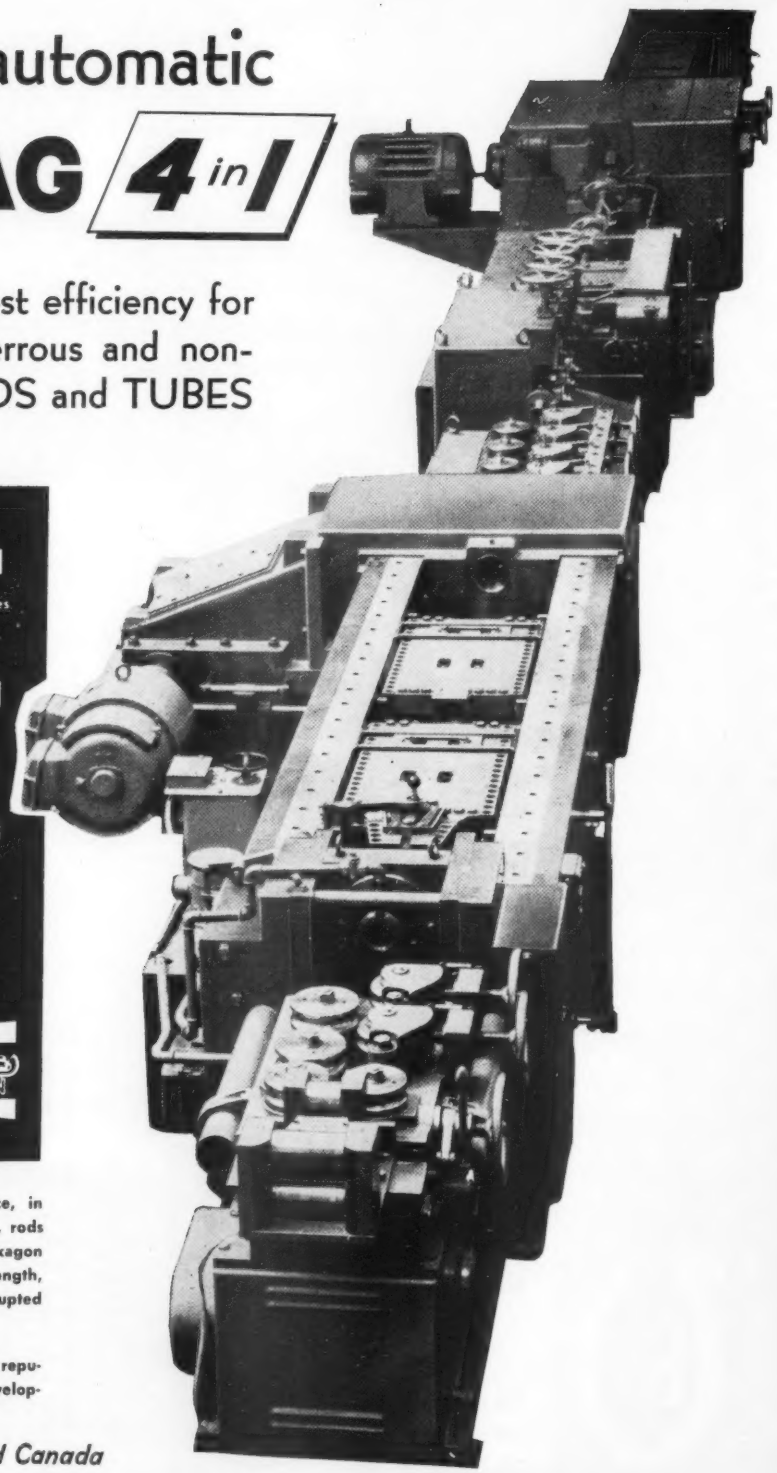
The fully automatic
SCHUMAG 4 in 1

ASSURES... greatest efficiency for manufacturers of Ferrous and non-Ferrous BARS, RODS and TUBES





- SCHUMAG "4 in 1" machines produce, in one continuous operation, finished bars, rods and tubes from round, square or hexagon material. They will finish draw, cut-to length, straighten and polish in one uninterrupted sequence.
- SCHUMAG "4 in 1" enjoys world-wide reputation as the ultimate in technical development.

Exclusive Representatives for U.S.A. and Canada

AMERICAN LAUBSCHER *Corporation*

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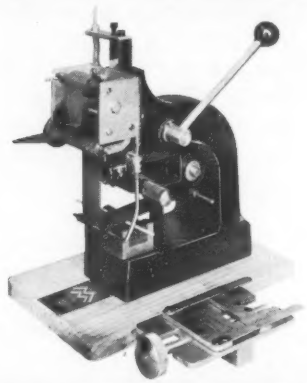
SCHUMAG AACHEN

MATTHEWS
Wire Marking
MACHINES

for
PRINTED
INDENTED
FOIL LEAF and
MOLDED MARKING

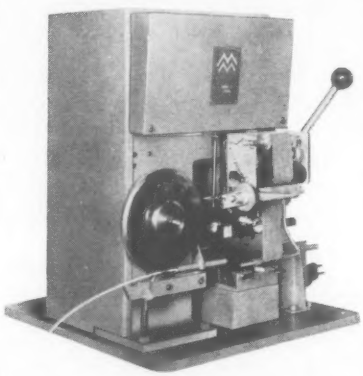
Here is the most complete line of equipment for marking all types of uncoated and coated wire and cable. Models range from simple hand operated machines to high-speed production friction driven and motorized units.

MODEL 4003 HAND OPERATED WIRE MARKER



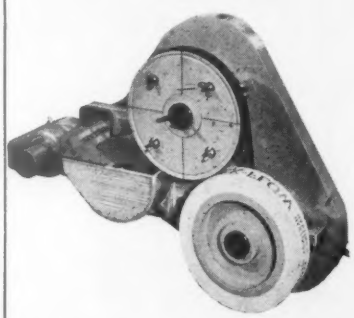
This machine is designed primarily for foil leaf marking "short runs" of coated wire. Electrically heated and controlled branding head features an adjustable automatic thermostat. Automatic foil feed and rewind mechanism assures quick disposal of used foil.

MODEL 4004 AUTOMATIC WIRE MARKER



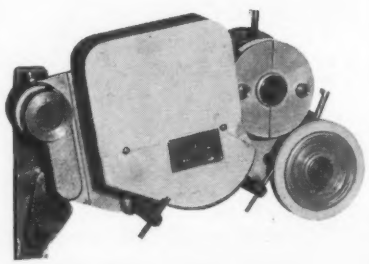
A motorized precision foil leaf unit for production marking. Marks and cuts off wire at predetermined lengths from ¾ inches to 7 inches. Snap-in type holder assures quick change of set ups.

MODEL 6011 IN-LINE OFFSET PRINTER



Provides continuous lineal marking on diameters of ½" or larger. Easily mounted above fast moving stock. Printing type size ⅛" to ⅜". Offset printing principle assures clear, smearless impressions.

MODEL 6010 OFFSET WIRE PRINTER

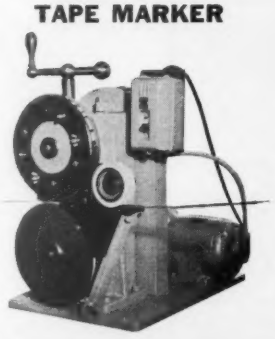


A light compact friction driven unit similar to the 6011, except for printing on free running stock of small diameters from .100 to ½ inch. Character size up to 3/16 inch.

MODEL 2400 WIRE MARKER

Friction driven unit mounted at the discharge end of the wire straightener, as wire is rewound. Diesengraved to controlled depths of .002 to .003 inches, provide clear impressions, every 6 inches or 12 inches, if desired. Accept diameters of .062 to .250 inch.

MODEL 3221 TAPE MARKER



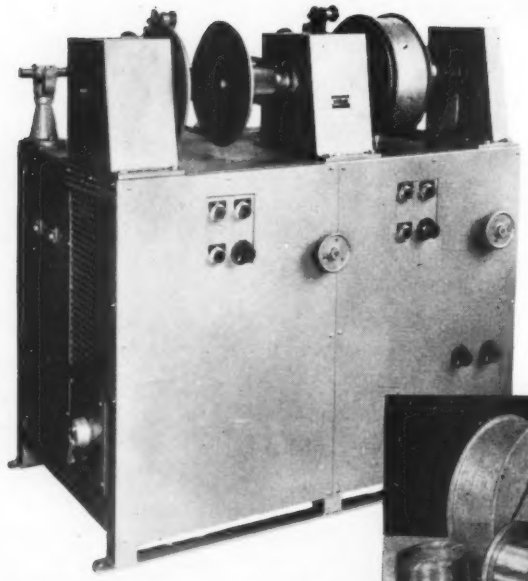
Supplies an embossed metal tape which fits between uncured rubber and the lead jacket mold. Resulting in a wire covering with raised molded characters. Tape is from stock reel and fed by motor driven guide roll.

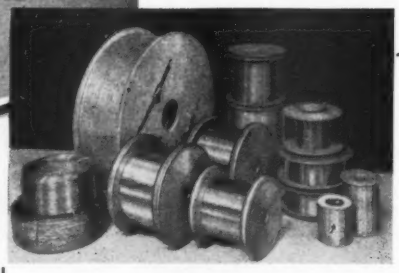
JAS. H. MATTHEWS & CO.
3962 Forbes Avenue • Pittsburgh 13, Pa.

Let our engineers recommend the most efficient, economical marking machine to fit your present installation.

LATEST

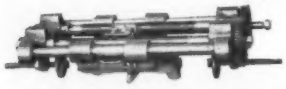
AUTOMATED MULTI-SPINDLE ROBERT J. EMORY SPOOLER





ADVANCED DESIGN ● HIGHEST PRODUCTION ● ACCURATE WINDING ● WIDEST RANGE ● FULLY ADJUSTABLE ● ONE MAN OPERATION ● PRODUCTION PROVEN ● MODERATE PRICE

MODEL 400 B Two to Ten Heads. Integral Payoff. Non-removable arbors. 3000 RPM Speed. Automatic Stops. No vibration.



EMORY NO. 700 TRAVERSE

Minimum number of wear parts. Two precision cut buttress thread screws are engaged alternately by bronze half nuts, giving absolutely positive, pin-point reversal. The "Trigger Action" reversing mechanism can be adjusted from 1½" minimum travel to maximum without stopping the spooler.

EMORY NO. 901 TINNING SPOOLER

This 24-spindle spooler handles wire from .003" to .080" in diam. Each spindle is operated as an independent member. Can be built to handle customer's spool size.

DETAILED FEATURES

1. Electrically controlled, run, stop, jog, speed
2. Individual drives for each spindle by motor or magnetic clutch
3. Variable speed spindles and traverse 18 to 1 ratio
4. Wire range One to 200 mils diameter
5. Fast spool and reel changes in seconds
6. Winds spools or tied cores
7. One to 200 lb. capacity
8. Automatic stops on each spindle for full spool or wire fracture
9. Controlled and calibrated tension
10. Uniform thread winding
11. Large capacity reels positioned on inclined bearings close to floor to eliminate lifting
12. Power drawn synchronized payoff
13. Constant linear speed of annealing and tinning operations
14. Electrically controlled drags and brakes synchronized with winding spindle
15. Available for braider — bobbin winding of multiple end strands at highest winding speeds, simplest operation
16. Special construction for winding magnet wire on disposable plastic or masonite spools

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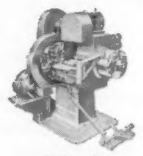
31 East Runyon Street Newark 8, N. J.

60 YEARS OF WIRE MACHINERY EXPERIENCE

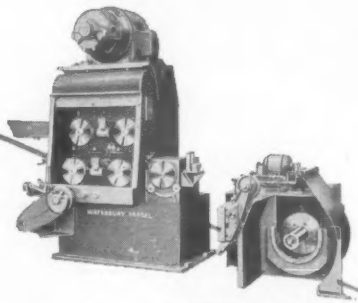
Over 60 Years Of Broad Experience As A . . .

SOURCE OF SUCCESSFUL WIRE MILL EQUIPMENT

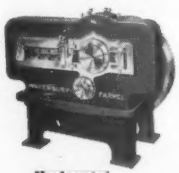
WATERBURY FOUNDED 1851 FARREL



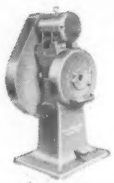
String-Up Machines with Roll Pointers and Hand Swagers



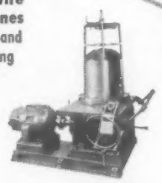
Upright Cone Wire Drawing Machines For Intermediate and Fine Wire Drawing



Horizontal Swagers

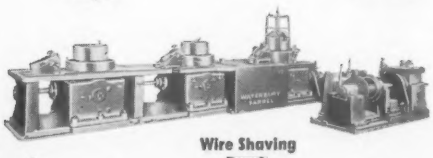


Rotary Swagers

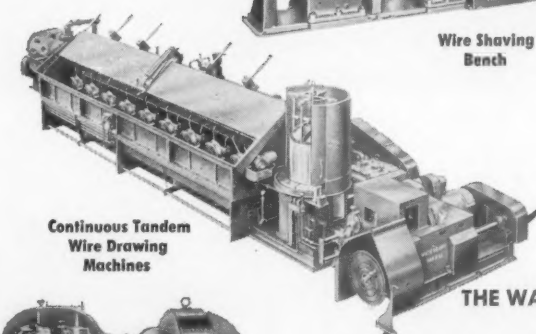


Vertical Bull Blocks

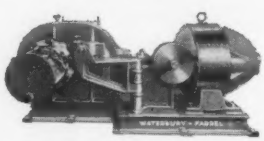
WF-35



Wire Shaving Bench



Continuous Tandem Wire Drawing Machines



Horizontal Bull Blocks

- BULL BLOCKS
- CONTINUOUS TANDEM WIRE DRAWING MACHINES
- HAND SWAGERS
- HORIZONTAL SWAGERS
- ROLL POINTING MACHINES
- ROTARY SWAGERS
- SLEEVE WIRE DRAWING MACHINES
- SPOOLERS
- STRING-UP MACHINES
- TRAVERSING WINDERS FOR FLAT WIRE
- UPRIGHT CONE WIRE DRAWING MACHINES
- WIRE FLATTENING MILLS
- WIRE SHAVING BENCHES

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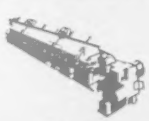
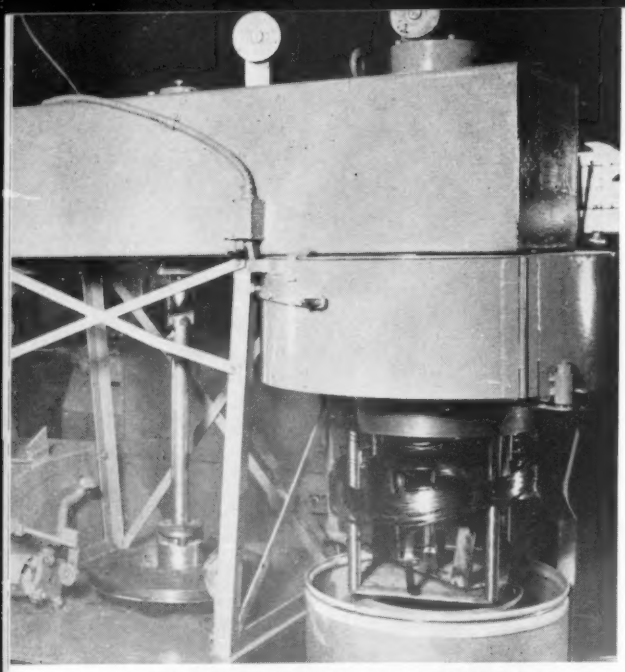


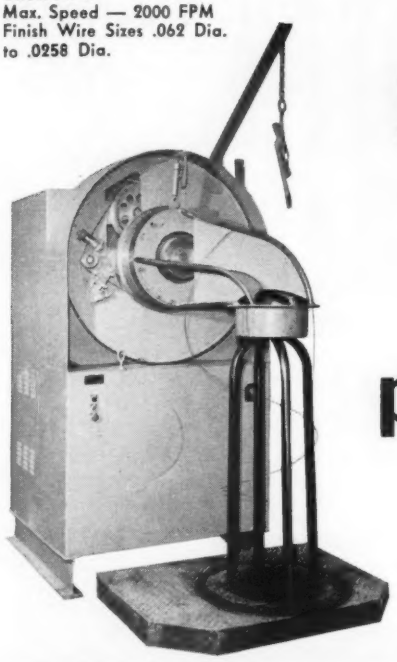
Wire Mill Equipment

Sendzimir Mills and Other Special Machinery



CONTINUOUS OPERATION ATTACHMENT
Fine wire dead block drawing attachment (adaptable to most standard machines) permits continuous operation.

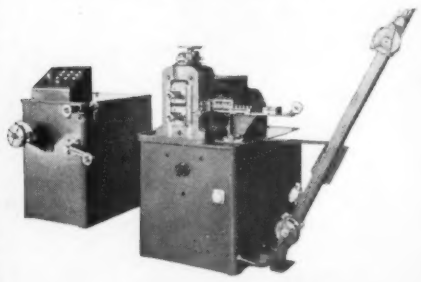
Wet Machine
Dead Block Attachment
Direct Drive
Max. Speed — 2000 FPM
Finish Wire Sizes .062 Dia.
to .0258 Dia.



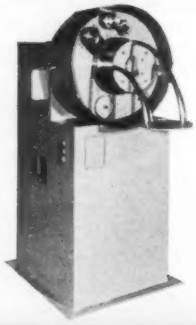
for all your wire drawing and processing needs

Coarse Wire Dead Block Attachment
AC, DC or Direct Drive
Max. Speed — 1600 FPM
Finish Wire Sizes .090 Dia. to .062 Dia.

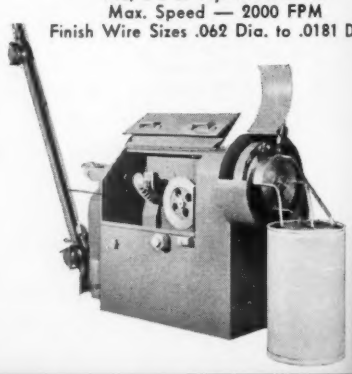
6" Diameter Rolling Mill
AC, DC or Hydraulic Drive
Max. Speed — 1800 FPM
Max. Entering Wire Size .150 Dia.



Fine Wire Dead Block (Motorized)
AC, DC or Hydraulic Drive
Max. Speed — 1800 FPM
Finish Wire Sizes .062 Dia. to .0181 Dia.

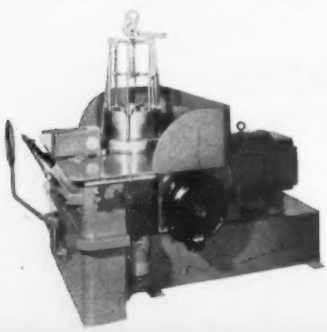


Dead Block Wet Drawing Machine
AC, DC or Hydraulic Drive
Max. Speed — 2000 FPM
Finish Wire Sizes .062 Dia. to .0181 Dia.

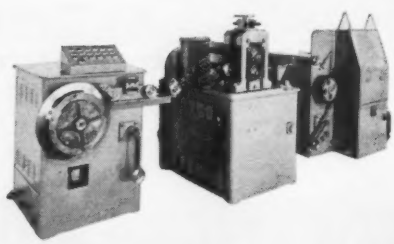


a complete service: Machine design, production planning, plant layout, installation, pilot operation.

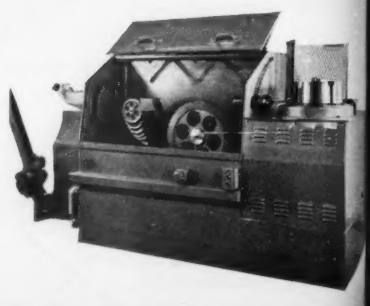
Single Hole Motorized Block (Wet or Dry)
AC or DC Drive — Max. Speed — 900 FPM
Finished Wire Sizes .125 Dia. to .062 Dia.



Combination Draw - Roll - Spool
AC, DC or Hydraulic Drive
Max. Speed — 1800 FPM
Max. Entering Wire Size .090 Dia.



Wet Drawing Machine
AC, DC or Hydraulic Drive
Max. Speed — 2000 FPM
Finish Wire Sizes .062 Dia. to .0258 Dia.



Manufacturers of Standard and Custom Designed Wire Drawing and Wire Processing Machinery

WIRE ENGINEERING ASSOCIATES, INC.

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REPRESENTATIVES: Midwest — Bronson & Bratton, Inc., 5161 S. Millard Ave., Chicago 32, Ill. — Phone Reliance 5-6200
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Radiant tube galvanizing pot handles 4000 lbs. per hour. Vent picks up combustion gases after they pass over strands, drying and preheating them.

Wickwire Spencer is latest major wire producer to change to Lee Wilson Radiant Tube Galvanizing

PREHEAT AND TANDEM LEAD SETTINGS DESIGNED FOR COMPACTNESS AND FLEXIBILITY. Wickwire Spencer Division of The Colorado Fuel and Iron Corp. is another of the major wire producers to change to Lee Wilson Radiant Tube Lead Annealing and Galvanizing Lines to get maximum efficiency at lowest possible maintenance costs.

The Wickwire Spencer line includes a preheat chamber, high temperature lead furnace and lead quench set in tandem, and the galvanizing pot—all radiant tube fired. Combustion exhausts from the galvanizing pot are utilized to dry and preheat the wire for galvanizing.

The compact unit is capable of producing 3500 lbs. per hour when used for lead patenting, or 5000 lbs. per hour for lead annealing.

Radiant tube heating assures longer pot life, less dross and reduced fuel consumption.

For the latest information on wire patenting, annealing or galvanizing, contact your Lee Wilson representative or write direct for your copy of our new bulletin.

Combination Lead Annealing and Quenching Furnace set in tandem with an 8' preheat chamber.

Lee Wilson* ENGINEERING COMPANY, INC.
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*ORIGINATORS AND LEADING PRODUCERS OF HIGH CONVECTION ANNEALING FURNACES

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VINYL COMPOUNDS "JOB-ENGINEERED" TO MEET THE MOST RIGID SPECIFICATIONS IN A WIDE VARIETY OF CONSTRUCTIONS

OPALON 1217
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for inside distribution cable jacketing with excellent service life

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for underground burial cable, with long service life and excellent resistance to moisture

OPALON 1102
OPALON 1103

for primary insulation of urban distribution wire; for jacketing of rural distribution wire, with outstanding weather resistance, excellent low temperature flexibility

OPALON 1101

for semi-rigid primary insulation of switchboard wire, with high crush resistance, excellent flexibility

OPALON 1006

for primary insulation of inside distribution cable, with good crush resistance, excellent flexibility

MONSANTO OPALON vinyl compounds are characterized by a balanced combination of easy processability and excellent physical properties. For the correct answer to your specific needs, write to Monsanto Chemical Company, Plastics Division, Room 754, Springfield 2, Mass.

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MONSANTO ENGINEER IN **PLASTICS**

Wire Machinery Inc.

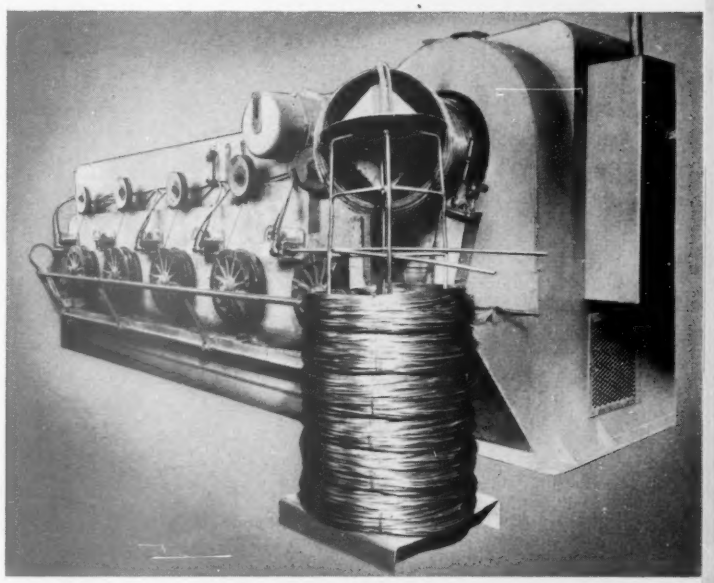
brings

EFFICIENCY

to YOUR finger tips!

SAVE With Whitacre DEAD BLOCKS

FITS ANY INSTALLATION



YOU CAN LOCATE YOUR WHITACRE WIRE DRAWING DEAD BLOCK ANYWHERE WITH WIRE LITERALLY PIPED FROM YOUR DRAWING MACHINE, WHITACRE DESIGN PERMITS ITS USE WITH ANY TYPE OF WIRE DRAWING MACHINE.

- CONTINUOUS PRODUCTION
- EXTRA LARGE PACKAGES
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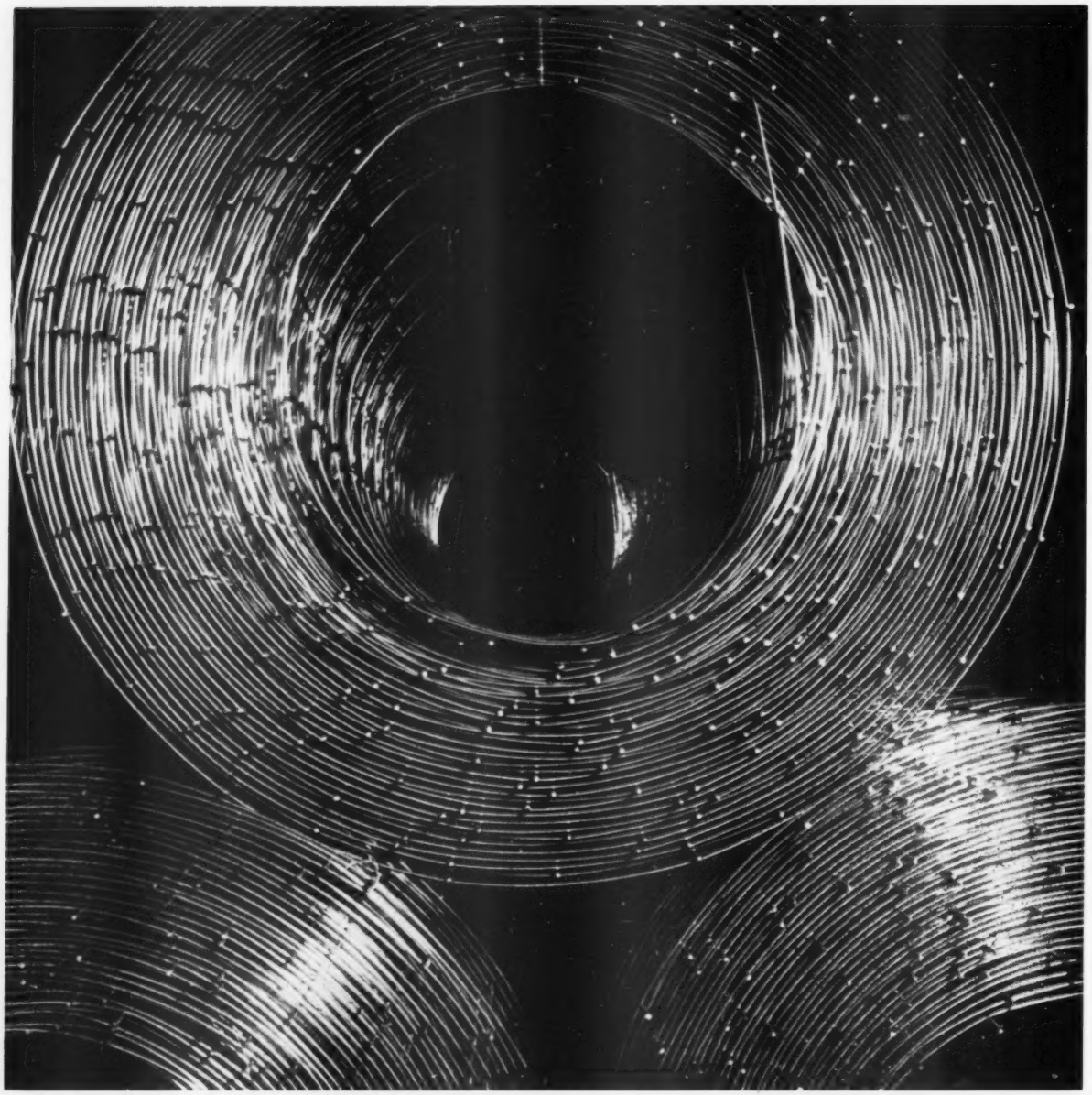

For nearly half a century we have been engaged in the development and manufacture of resistance welding machines and it will soon be 15 years since we built our first mesh welder. This many years' experience has proved invaluable in the development of modern mesh welding plants. Today we have a complete range of machines available.

SCHLATTER

Size 1 for light mesh in rolls and sheets, wire ϕ 0,06 to 0,16 inch, width 79 inch
Size 2 for concrete reinforcing steel mesh in rolls and sheets, wire ϕ 0,12 to 0,39, width 104 in.
Size 3 for concrete reinforcing steel mesh in rolls and sheets, wire ϕ 0,12 to 0,39, width 147 in.
Size 4 for concrete reinforcing mesh in sheets, wire ϕ 0,16 to 0,47 inch, width 147 inch
Size 5 for heavy concrete reinforcing steel mesh in sheets, wire ϕ 0,16 to 0,47 in., width 104 in.

H. A. SCHLATTER Ltd. ZOLLIKON-ZURICH (Switzerland)
Manufacturers of Electric Welding Machines and Electronic Controls

Representative for Canada and the U.S.A.

PAUL REICHER MACHINERY and EQUIPMENT, LTD.

600 EGLINGTON AVE., EAST **TORONTO 12, ONT., CANADA**

WIN 20% ACROSS THE BOARD!

ALL GRADES AVAILABLE WITH OR WITHOUT CORES

Thilco Protective COIL WRAPS

with exclusive LONGITUDINAL PLEATING wins you —

20% MORE LINEAL FOOT YIELD / **20% MORE MACHINE WRAPPING EFFICIENCY** / **20% MORE STORAGE SPACE FOR OTHER NEEDS**

New, exclusive Thilco LP (Longitudinal Pleating) provides two-way stretch, adds approximately 20% more lineal foot yield to Standard creped grades. This added footage per roll increases machine coil wrapping efficiency by 20% — cuts downtime by reducing the number of roll change-overs, and saves another 20% on storage space. LP increases wrapper flexibility and is especially advantageous for packaging small circumference coils. All Thilco Coil Wraps are available *with* or *without* pleating in standard widths 3" to 5½" or in special widths to order. All can also be trade-mark Print Decorated. Write for details.

5 STANDARD GRADES

1. ASPHALT LAMINATED
2. ASPHALT LAMINATED — REINFORCED
3. BLOND LAMINATED — (Non-Staining)
4. BLOND LAMINATED — REINFORCED
5. CREPED KRAFT (Plus Custom Grades)

NEW CREPED WEIGHTS

Now available in basis weights up to 80 lb./50 lb./60 lb. laminated (50% heavier than previous available weights) or 90 lb. Single-Ply, creped up to 50% stretch.

NEW PALLET LOAD "PUT-UP"

Saves Handling Costs — Increases Efficiency by 20%

Thilco Coil Wraps are compactly stacked on pallets, spindled on dowels at corners, interleaved with Thilco heavy-duty Kraft at 4-roll layer intervals to reduce shifting, then wrapped with an abrasion resistant, waterproof Thilco WRAP-DRI paper blanket which produces a sturdy, weather-resistant packaged unit. This new "pallet packing" method reduces handling costs, saves approximately 20% on storage space, provides immediate on-sight inventory and increases efficiency generally. There are many other advantages you'll want to learn about.

Write for Thilco Brochure containing Coil Wrap Samples and complete descriptive information.

THILCO PAPERS INCLUDE:

- **WRAP-DRI** Waterproof protective papers
- **THILCO-TUF** Stainproof laminated papers
- **VAPOTITE** moisture-vapor barrier papers
- **POLY-COATED** and special treated papers
- **MG and MF** natural and colored krafts
- **GLASSINE** and greaseproof papers
- **SPECIAL BAGS** and case liners

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Functional Papers
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NEW LOW-COST PLASTICIZER

For High Temperature Vinyl Wire Insulation

PX-126

A balanced combination of desirable properties . . . at low cost . . . makes Pittsburgh PX-126 (Ditridecyl Phthalate) a superior plasticizer for vinyl insulation compounding. Formulations made with PX-126 exhibit *outstanding:*

- Retention of elongation
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- Resistance to chemical breakdown
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If you have a vinyl insulation compounding problem or you would like to discuss plasticizers "in depth," call or drop us a note on your letterhead . . . and watch things happen *for you!*

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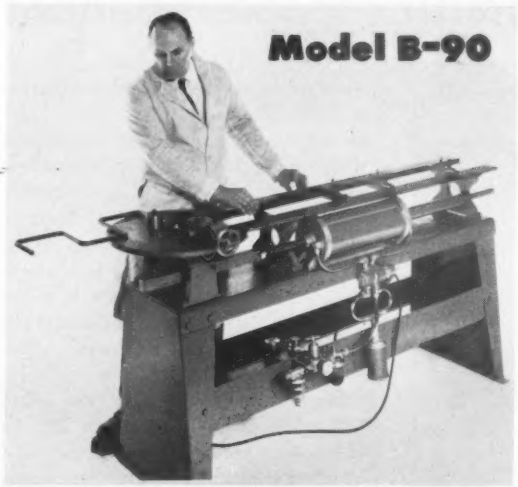


MODEL B-90 HEAVY DUTY PNEUMATIC POWER BENDER

Bends five ⅜" steel rods at one time.

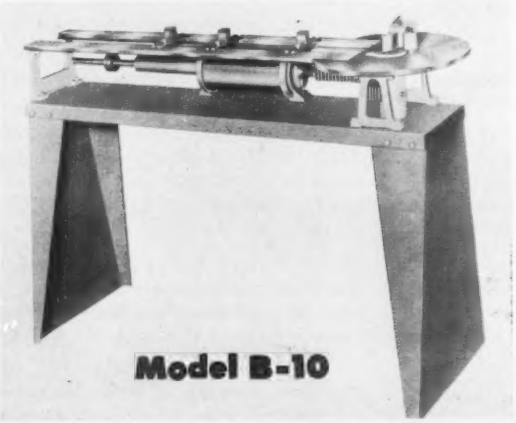
Specifications:

- Capacity ¾" steel rod, bending time, one second.
- Large 20" working table, hardened tools, adjustable Flexible, easy to set-up, bends up to 270°.
- Comes with foot operated valve.
- Floor space 20" x 86" die height 2".

This is a universal type bending square, vee, round with adjustable die to accommodate any size stock.

Machine is ready to attach to your air supply, with automatic cylinder and valve lubrication.

100 Lbs. max. air pressure is required.



MODEL W-60 AUTOMATIC PNEUMATIC WIRE STRAIGHTENER AND CUT-OFF MACHINE

Specifications:

- 1/32" to ¼" Diameter.
- Up to 170' per Minute.
- Simple Bundle Racking.
- Positively Eliminates Roller Marks.
- Cuts Wire from ¼" to 12' Lengths.
- 3 HP Motor.
- Air Pressure Required 20-4-Pounds.
- Simple to Operate.

Most Economical Wire Straightener and Cut-Off Machine on the Market Today.

MODEL B-10 PNEUMATIC BENDER (Lower Left)

Bends up to five ¼" steel rods at once.

Specifications:

- Capacity up to ½" steel rod, bending time one second.
- Large 15" working table. Hardened tools.
- Adjustable gauges.
- Flexible, easy set-up, bends up to 135°.
- Floor space 17" x 52" die height 1½".
- Complete with foot operated valve.

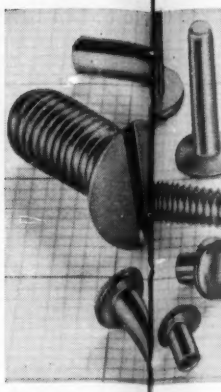
Takes minutes to set up for short run, or heavy production. It comes complete, ready to attach to your air supply with automatic cylinder and valve lubrication.

Write Today For Complete Catalog

W V INDUSTRIES

FRANKLIN LAKES, N.J.
Phone FEderal 7-6200

Cold heading is a high-speed, high-volume process even with intricate parts requiring secondary operations. Die sets are not expensive—set-up time is moderate. Scrap is no factor. Cold working improves mechanical properties. Use the handy chart and comparative data covering 14 suitable Anaconda alloys to open the door to some sizable savings. Take a second look at the way you're making parts like those at the right—and connector components in electrical controls—and bases for semiconductor devices.



Fast, low-cost cold heading with these Anaconda

Alloys and Nominal Compositions, %	Temper*	Prop. Limit, 1000 psi	Yield Str., 0.2% Offset, 1000 psi	Tensile Strength, 1000 psi	Red. Area, %	Plasticity Index, %
Brasses						
Commercial Bronze-14	A	20.5	43.0	51.0	85	40
90 Cu, 10 Zn	B	39.0	57.5	64.0	81	61
Red Brass-24	A	23.0	49.5	55.0	82	42
85 Cu, 15 Zn	B	42.0	62.0	71.0	77	59
Low Brass-32	A	33.5	50.0	57.0	81	59
80 Cu, 20 Zn	B	44.0	65.0	76.5	79	58
Cartridge Brass-42	A	32.5	51.0	63.5	80	51
70 Cu, 30 Zn	B	48.0	70.0	82.5	73	58
Yellow Brass-58	A	38.0	52.0	62.0	79	61
65 Cu, 35 Zn	B	52.5	70.5	81.0	72	65
Cupro Nickels						
Cupro Nickel, 10%-755	A	38.5	52.0	54.0	81	71
88.35 Cu, 10 Ni, 1.25 Fe, 0.4 Mn	B	56.5	76.5	79.0	80	72
Cupro Nickel, 20%-712	A	34.5	57.5	60.5	83	57
79.5 Cu, 20 Ni, 0.5 Mn	B	46.0	69.5	74.0	74	62
Nickel Silvers						
Nickel Silver, 18%-716	A	37.5	57.5	60.0	83	62
72 Cu, 9.75 Zn, 18 Ni, 0.25 Mn	B	39.5	64.5	67.5	78	59
Nickel Silver, 12%-744	A	43.0	58.0	67.0	77	64
65 Cu, 22.75 Zn, 12 Ni, 0.25 Mn	B	50.5	81.0	86.0	73	59
Tin Bronzes						
Phosphor Bronze, (A)-351	A	38.0	60.5	66.0	83	58
94.75 Cu, 5 Sn, 0.25 P	B	50.0	80.0	87.5	79	57
Phosphor Bronze, (C)-353	A	44.0	64.0	76.5	81	58
91.75 Cu, 8 Sn, 0.25 P	B	57.0	90.0	99.0	76	58
Phosphor Bronze, (D)-354	A	49.5	73.5	86.0	71	58
89.75 Cu, 10 Sn, 0.25 P	B	66.5	101.0	111.0	69	60
Leaded Copper-126	A	20.0	40.0	41.5	69	48
99 Cu, 1 Pb	B	27.5	48.0	51.5	64	53
Copper-Silicon Alloy						
Everdur®-1015	A	34.5	54.0	55.5	81	62
98.25 Cu, 1.5 Si, 0.25 Mn	B	43.5	67.0	74.0	76	59

The temper designations "A" and "B" have no commercial significance.

This table includes results of special tension tests made in Anaconda laboratories. It is a useful guide to the right copper alloy for a cold heading job.

Each alloy is shown in two standard tempers, A (¼ hard) and B (½ hard). These designations show the amount of mechanical strengthening the alloy has been subjected to before cold heading. Though it is assumed that the cold heading process enhances these values, the preheading values are widely used in design—to be on the conservative side. The tempers obtained by wire drawing represent the following cold reductions: A, about 20%; B, just under 40%.

"Plasticity Index" is a useful indicator of the amount of cold work an alloy will take. It is the ratio of proportional limit to ultimate tensile strength expressed in per cent. A low value of the index indicates that a large part of the total stress range to fracture is devoted to deforming the alloy plastically. Thus an alloy with a low value flows more easily during the cold heading, and parts made from it can be designed with greater complexity of shape. For best formability, a low plasticity index should be coupled with a high percentage reduction in area—to minimize shear fracture.

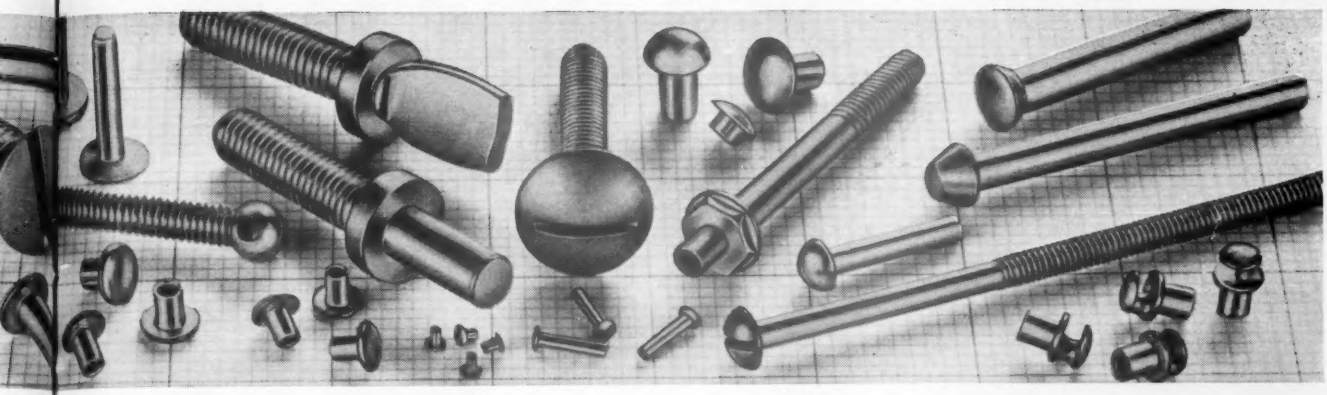
The effect of alloying elements on mechanical properties is clearly seen in the table. The main purpose of alloying copper is to increase ultimate and yield strengths. Alloying has other important effects, but the table shows how these alloying elements influence the balance between increased strength and formability in cold heading. In the selection of an alloy for cold heading, this interplay is usually the major consideration—with factors like corrosion resistance, color, surface finish, and cost playing supplementary roles.

WHAT ALLOYING ELEMENTS DO—Addition of a second element, or a series of elements, to copper affects the crystal structure so that flow in certain directions becomes difficult except by going to higher stress levels. The effect depends not only on the element added but on its proportion in the matrix. Here are brief descriptions of how the various major alloying elements influence the engineering behavior of copper metal:

ZINC plus copper makes brass up to 20%, the "low brasses"; from 20% to about 35%, the "high brasses." The addition of zinc substantially improves strength, yet the metal retains good formability (a low plasticity index with high reduction in area). Malleability does, however, decrease as the percentage of zinc increases. The diagram on the next page illustrates how a choice is made between alloys of similar zinc content. Thermal and electrical conductivity decrease as zinc content increases, and color changes from reddish hue to greenish yellow.

NICKEL, the principal alloying element in the cupro nickels, improves resistance to corrosion. In the nickel silvers, nickel and zinc also control color. As nickel content increases, color moves from brass shades to silver white. Both cupro nickels and nickel silvers have high percentage reduction in area. Their slightly higher plasticity index tends to reserve their use to parts requiring exceptional corrosion resistance.

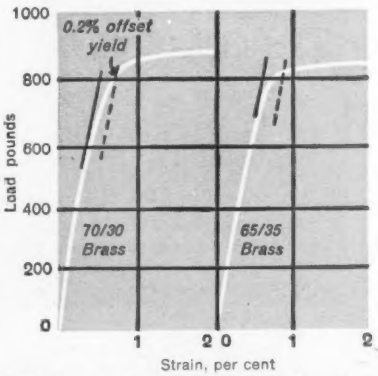
TIN as the main alloying element in the phosphor bronzes contributes high tensile and yield strengths, along with excellent fatigue resistance. For cold heading, the biggest advantage of phosphor bronzes is their favorable combination of low plasticity index and



alloys can solve more problems than you realize

high reduction in area—second only to the straight brasses. Electrical and thermal conductivities drop as tin content increases.

LEAD enhances the machinability of copper by acting as an embrittling agent, correspondingly reducing the per cent reduction in area, but with little effect on the plasticity index. For cold heading, this means that even though the plastic range is great, there is a limiting amount of work hardening that can be reconciled with shear strength. Though it is not recommended for shapes where shear forces predominate in the cold heading operation, Leaded Copper-126 has some very interesting advantages. It has an electrical conductivity rating of 98% IACS and a machinability rating of 80 (free-cutting brass = 100) for economical secondary operations. It offers a possible means of reducing the cost of electrical connector components, where shape and tolerances are within the range of cold heading capabilities.



Which is more ductile—70/30 brass or 65/35 brass? These load-strain curves on the two alloys in temper A (¼ hard, 18% reduction) shows 70/30 cartridge brass is slightly more formable—because it begins to flow plastically sooner than the 65/35, yet continues to deform to a higher ultimate load. Thus the plasticity index is lower. This, combined with higher per cent reduction in area, makes 70/30 a better choice when shear is a major factor.

SILICON content of 1.5% adds toughness to copper and improves its ductility — providing a combination of plasticity index and reduction in area favorable to cold heading. Such an alloy is well-suited to impact applications, particularly where very low temperatures are met, as in cryogenic equipment. As the lower copper-silicon alloys work-harden less rapidly than those of higher silicon content, Everdur-1015 (shown in the table) was developed for cold headed parts, especially where secondary operations, like roll-forming of threads, are required.

UPSET RATIO IS IMPORTANT — The alloys and alloy groups shown in the table are all suitable for cold heading. Often, however, the precise strength level or the exact service conditions are not known. Then the best guide is the approximate amount of cold work needed to form a given upset. This is the upset ratio—the ratio of final upset diameter to the original wire diameter.

WHEN UPSET RATIO IS FROM 2 TO 3, only one or two blows are usually necessary, and the choice of material is not critical. Any alloy from the table, in any temper, will be suitable.

WHEN UPSET RATIO APPROACHES 4.5 TO 5, two or more blows are necessary, and selection of material becomes critical. Choice is usually made after trial heading of one or more possible combinations of alloy and temper.

FOR UPSET RATIO OVER 5, multiblow or progressive heading must be employed, and annealing between blows may be necessary. Here only alloys with the most favorable combination of plasticity index and per cent reduction in area should be considered.

SEMICONDUCTOR BASES. As quantities of these components soar, cold heading should be considered for economical production. Many of the copper alloys offer the high electrical and thermal conductivities needed. But severe heat cycling in manufacture rules out the cold heading alloys listed. The metal must be deoxidized or oxygen-free to resist hydrogen embrittlement. For secondary operations, it must also have good machinability. And where high torque is used to tighten the base to the heat sink, it must in addition have high strength. Various combinations of these properties are found in such alloys as DLP Copper-104, OFHC* Copper-120, Tellurium Copper-127, and Chromium Copper-999 — all available as cold heading wire.

TECHNICAL SERVICE. Although Anaconda American Brass does not produce cold headed parts, it does make cold heading wire in the wide variety of alloys and tempers required. Anaconda has specialists in this field to help you select the right material for your job. Simply give us a sample, sketch, or description of the part or parts—along with service conditions, quantities, properties required — for a recommendation. See your Anaconda representative, or write: Anaconda American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 6052

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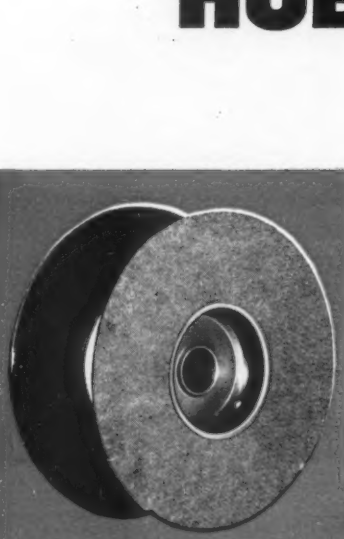

Reel with a masonite flange and cardboard hub assembled with steel end washers for domestic and export shipment of wire, tape, braid or other materials.

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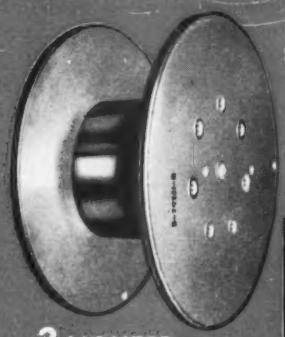
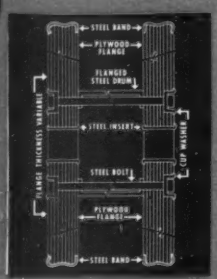
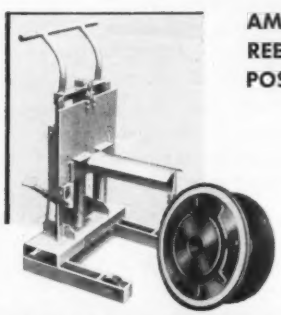


3 LIGHTER WEIGHT FOR EASIER HANDLING

4 ABILITY TO WITHSTAND SUBMERGENCE IN WATER

5 WIDE RANGE OF SIZES





AMERICAN REEL POSITIONER

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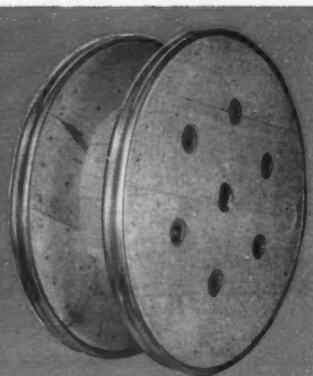

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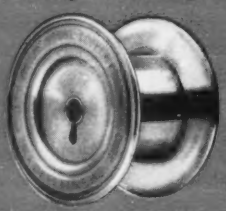

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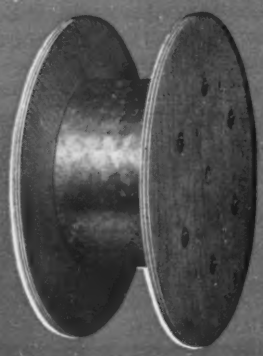

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The Wire Outlook

Probably chief among the culprits tending to destroy the American way of life are the New Dealish, left-wing regulators — who are the big Federal spenders. Two classes of boondogglers, whose self interests are closely allied, really go to town on unneeded expenditures — Congressmen and bureaucrats. The former think mainly in terms of those projects that will assure re-election; the latter principally of expanding their spheres of influence.

Also, look at the untold billions spent on so-called "veterans." It is a citizen's duty to defend his country and it so happens that it is still necessary to maintain a large army. For this service, benefit obligations pile up each year at an alarming rate, even though a veteran may suffer no physical injury, and in fact, many may even emerge with character and training advantages not possessed previously. Outlays for them are politically and pressure group inspired.

Look at our farmers and the system of maintaining certain of them through crop price supports that were set up as a temporary depression expedient. How long will this last? Storage of surpluses alone is said to be costing us $1000.00 a minute. At one time our agrarian population was considered the epitome of self reliance and independence. Supine reliance on government handouts has all but reduced a good portion of these once-vaunted stalwarts to the status of parasites on the body politic.

Look at unemployment compensation. Originally designed to provide for those who were ready, willing and able to work, it has become an abused political football by which thousands of unconscionable individuals are able to live without working at your and my expense. But they still have votes! Washington bureaucrats have made it all but impossible for states to take care of their legitimate unemployed without giving up important rights unless the free-riders are included.

Look at government operated businesses. These not only compete with private enterprise, but contribute nothing in taxes or profits to government coffers. On the contrary, they are reputed to lose much money that taxpayers have to make up.

And consider our State Department, with its hundreds of thousands of minions crawling all over the face of the earth, spending bureau funds on undesired and undesirable projects with a free hand, with the result that many nations no longer respect our judgment or trust our motives.

There are, of course, high-minded statesmen, interested in economy and honest government. Unfortunately, they are an ineffective minority. Sound business principles apparently either are disregarded by or unknown to the majority of our solons.

Due to the terrific rate of government spending and the unparalleled size of the national debt, taxes are so high that businesses are hard put to find money for expansion and modernization, individuals have less money than they should have for personal needs, and we drift slowly each year more toward the pattern of those socialized states we all profess to abhor and decry. Should this come to pass, it wouldn't take long for the Congress to become a puppet in the hands of another dictator.

In the coming elections it would be well for each citizen to scan the records and platforms of the presidential and congressional candidates. Those who stand for increased spending, who are prone to yield to pressure groups, and who would extend more benefits to special interests, should be repudiated forthwith at the polls. It has been estimated that the Kennedy platform, if carried out, would add another 12 billion dollars to the Federal budget. What would this do to taxation rates?

The planks in the aforesaid platform must make Moscow feel that we are making progress — toward their system. 1960 is a year in which our citizenry should reject the welfare state ideology for all time.

Edmund A. Sickels

EDITOR

SNEAK PREVIEW of R. H. Miller's production . . . "MEET US IN CHICAGO"
(at the Annual Wire Association Convention)

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Pictured above: (1) Randolph V. Miller, (2) Walter Smigel, (3) Harry Davis, (4) Joseph Piscitell, (5) E. Jefferson Crum, (6) Alfred J. LeBlanc, (7) Eric Rylander.

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Vol. 35 OCTOBER, 1960 No. 10

An Economic Analysis of Acid Pickling vs Multiple Strand Blast Cleaning of Wire Rod

by Gilbert D. Dill, Consultant
On Blast Cleaning Process Applications
And Material Handling Methods
Mishawaka, Indiana

One of the prerequisites for this paper demanded that it present information that had not been covered in previous papers. Since the record shows that acid pickling and blast cleaning have been separately treated many times, the only new approach of any real value would be a factual comparison of the two.

* * *

Therefore the objective of the following analysis is to outline typical installations of these methods of rod cleaning on a comparative basis and provide sufficient facts and figures from which you may conclude the mirits of one over the other when applied to your particular operations.

Acid Pickling of Coiled Rod

We are all familiar with acid pickling and the many improvements in processing, material handling and equipment design achieved to-date. A modern plant of 24 tons per hour capacity will produce cleaned and lime coated rod at a reasonably low cost per ton for a comparatively low investment cost.

* * *

For this analysis we have chosen a typical installation incorporating the following components:

1. Outdoor rod storage serviced by an overhead gantry crane.
2. Mechanized conveyor extending from outdoor storage into pickle building and arranged to carry 4,000# racks of coils, each comprising one pickle hairpin load.
3. One pickle line having the following units:
   (a) Overhead crane for handling 4,000# hairpins of coiled rod.
   (b) Three acid tanks with mechanical rocker arm agitation for 4 pins per tank.
   (c) One cold water rinse tank with constant water flow.
   (d) One high pressure rinse spray at 300 psi.
   (e) Three coating tanks arranged to provide light, medium or heavy lime coats or any desired combination.
   (f) Two flash bakers equipped with gas fired hot air blowers.
4. Mechanized conveyor extending from flash bakers to an adjacent delivery point for easy transfer of pin load to transfer truck.
5. Approximate capital cost F.O.B. manufacturer for pickling equipment and building is $600,000.

* * *

In order to present comprehensive operating data and cost figures, the following items were obtained from three modern pickle line operations and adjusted to show average values for the typical line described above.

Gilbert D. Dill

Mr. Dill has been active as a Consultant since January 1959. Prior to that time starting in 1944 he served 14 years with the Wheelabrator Corporation pioneering the development and application of blast cleaning in the steel industry. He is a member of The Wire Association, the Association of Iron and Steel Engineers and has been connected with the steel industry since 1924. His 20 years engineering experience prior to 1944 includes steel mill, oil refinery and coal mining, material handling design. During this period 7 years were spent with the Arthur G. McKee and Company, 8 years with the H. A. Brassert & Company and 5 years American Dressler Tunnel Kilns and Philadelphia Reading Coal & Iron Company.

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 16, 1960 at Chicago, Ill.

Acid Pickling Production Data

1. Production will be 12 pins or 24 tons per hour.
2. Weight of rod on one pickle hairpin is 4,000 pounds or 2 tons.
3. Range of rod sizes pickled is 3/16 inches through 1½ inch dia.
4. Acid practice:
   (a) Acid by weight is 9% at start and finish at ¾%.
   (b) Temperature range is 155 degrees F. at start and 187 degrees at dump.
   (c) Bath cycle time is 48 hours.
   (d) Iron at time of disposal is 7 to 9%.
   (e) Volume of pickle liquor waste in gallons per unit of time is 600 gallons per hour @ ¾% acid.
5. Complete pickle cycle time is 60 minutes.
6. Number of operating personnel is 3 men, 1 line operator and 2 handling stock.

Acid Pickling Cost Data

	Cost Per Ton
1. Direct Labor	.55
2. Fuel	.10
3. Repairs and maintenance	.38
4. Tools and supplies	.06
5. Sulphuric acid	.38
6. Water	.01
7. Lime	.04
8. Pickling components — inhibitors, etc.	.09
9. Steam	.30
10. Electric energy	.08
11. Tractor and crane expense	.50
Total cost per ton	$2.49

Multiple Strand Blast Cleaning

Blast cleaning is a comparatively new art as applied to wire rod and bar stock for cold drawing. Many of you have heard papers given on the subject but some of our new members may not be familiar with the development of this cleaning method and therefore I have listed the authors and their contributions for your reference.

* * *

To my knowledge the earliest paper which covered the process of blast cleaning wire rod was entitled "Continuous Strand Cleaning and Coating of High Carbon Rods & Wire" by **David L. Doty** of the Jones & Laughlin Steel Corporation, presented in October 1949 and to-date the following additional authors have further contributed to the development of the art:

"A Progress Report on the Development of the Wheelabrator Mechanical Cleaning Process" by *Gilbert D. Dill* of the American Wheelabrator & Equipment Corporation, presented 1951.

"The Progress of Mechanical Descaling of Rods for Wire Drawing — a Symposium" by *Geo. Fecson, H. J. Godfrey, C. F. Wickwire, Arthur Hedman, Walter A. Smigel, Allyn E. Harper, S. L. Stalson,* presented in 1953.

"Wire Rod Descaling in Germany" by *Dr. O. E. Koegel,* Manager, Westfalische Drahtindustrie, Hamm, West Germany, presented in 1955.

"From Hot Rolled Rod to Finished Wire Through the Process of Mechanical Blast Cleaning" by *Gilbert D. Dill* of the Wheelabrator Corporation, presented in 1957.

"Mechanical Blast Cleaning of Wire Rods" by *Kenneth J. Sorace* of the Lamson and Sessions Company, presented in 1957.

"Continuous Patenting, Cleaning and Coating of Rod" by *Raymond F. Warner, Jr.* of the Leschen Wire Rope Division of the H. K. Porter Company, presented in 1958.

"Recent Experience with Shot Blast Cleaning of Rod" by *Kenneth J. Sorace* of the Lamson and Sessions Company, presented in 1958.

"Continuous Patenting, Cleaning and Coating of Steel Rods" by *Donald K. White* of John A. Roebling's Sons Corporation, presented in 1958.

"Descaling of Wire by Shot Blasting" in two parts:

Part I — "Introductory Remarks on Mechanical Descaling in General" by *Dr. Heinz Berge.*

Part 2 — "Recent Experiences in Shot Blasting Practice" by *Dr. Hans Krautmacher.* Both of these gentlemen are executives of the Akliengesellschaft fur Eisen — und Draht — industrie, Hamm, West Germany, presented in 1958.

* * *

The application of blast cleaning of multiple strands of rod as a means of replacing acid pickling in this country has till now not been practical from a cost stand-point. The paper by Dr. Berge and Dr. Krautmacher is very complete and shows that in Germany with their lower unit costs, blast cleaning can replace pickling.

* * *

Here in the States, with our high unit costs, it becomes necessary to improve on Dr. Krautmacher's operation if we wish to achieve a cost per ton lower than acid pickling. Therefore we have devised a more efficient blast cleaning machine, and substituted dead block take-up units in place of standard take-up reels in order to produce, when desired, a single hole drawn wire instead of cleaned and coated rod. In addition, in view of improved welding techniques and heavier coils of rod, it is proposed to use a higher cleaning rate and fewer strands of rod to achieve the desired production.

* * *

With these improvements, we find that we have a choice of two methods of applying the process to produce a tonnage of cleaned, coated and drawn wire comparable to the previously described pickle line's production of 24 tons per hour.

* * *

The first method would be to clean a sufficient number of strands at a low speed per strand to produce the desired tonnage.

* * *

The second method would comprise several high speed lines at the blast cleaning end to produce the desired tonnage and then merge them into a single multiple strand line for coating and drawing.

* * *

The following analysis of the operational data of the two methods based on an average rod size and heavy coils brings to light some interesting factors.

(See table top of next page)

Reviewing the above data, we find the following important variations which dictated our choice of the second high speed method for this analysis:

1. **The higher cleaning rate of the 4-2 strand lines will provide higher drawing efficiency at the dead block take-ups.**
2. **The 4-2 strand lines require only 8 pay-offs which is 16 less than the 24 strand line.**
3. **Thru the use of 4 separate cleaning lines, total production is not lost in case of a shutdown in any one. The multiple strand line does not have this feature because if one or more strands stop, they all have to stop or the down strands will be overblasted and work hardened.**
4. **The total number of operators is 5 for the 4-2 strand lines as compared to 6 for the multiple strand lines.**

Description of Proposed 4-2 Strand Blast Cleaning Line

The following description of a typical high speed line is proposed for comparison to acid pickling. We realize it will not meet all production requirements but we believe its design is flexible to the extent that thru rearrangement

	First Method Multiple Strand Low Speed Line	Second Method 4-2 Strand High Speed Lines
1. Cleaning Rate	100 F.P.M.	300 F.P.M.
2. Average Rod Size	3/8" dia.	3/8" dia.
3. Weight of Coil	1,000 lbs.	1,000 lbs.
4. Length of Coil	2,660 ft.	2,660 ft.
5. Feed Time per Coil	26.6 min.	8.86 min.
6. No. Strands & Pay-offs	24	8
7. Total Welding Time @ 2 min./Strand	48 min.	16 min.
8. No. of Operators	3	4
9. No. of Strands per Operator	8	2
10. Welding Time per Operator	16 min.	4 min.
11. Handling Time per Operator	10.6 min.	4.86 min.
12. Lineal Ft. per Hour Total	144,000 ft.	144,000 ft.
13. Production per Hour Total	54,144 lbs. 27 tons	54,144 lbs. 27 tons
14. Lime Coating	3 ft. immersion	9 ft. immersion
15. Lime Immersion Time	1.8 sec.	1.8 sec.
16. No. of Dead Block Take-ups	24	8
17. No. of Take-up Operators	3-8 strands each	1-8 strands
18. Weight of Finished Coil	3,000 lbs.	3,000 lbs.
19. Size of Finished Wire. 30% reduction	.2625" dia.	.2625" dia.
20. Time to Coil 3,000 lbs. per Strand	79.8 min.	26.58 min.
21. Time Available to Strip each Strand	3.32 min.	3.32 min.
22. Total Stripping time each Operator	26.56 min.	26.56 min.
23. No. of 3,000 lb. Coils per Hour	18.0	18.0
24. Available Stripping Time for Hourly Production	59.76 min.	59.76 min.
25. Estimated Actual Stripping Time per Strand	2 min.	2 min.
26. Actual Stripping Time for Hourly Production	36 min.	36 min.
27. Available Handling Time	24 min.	24 min.

and substitition of components, most requirements can be fulfilled.

* * *

Before we can define the scope of this line, it is necessary to assume certain facts and conditions.

* * *

The trend in blast cleaning today is to clean the heavy diameters of rod in line with cold drawing and other operations which require the rod to be processed in strand form. I am particularly referring to the many installations processing bolt stock and large diameter wire, and it is in expectation of an expansion of this form of blast cleaning that we have chosen 1/2" dia. rod as a maximum size to be processed in this new type line.

* * *

It has also been assumed that 1/2" rod and smaller can be readily handled around sheaves at high speeds. Several production operations are being successfully operated at speeds above 300 F.P.M.

* * *

All rod processed in this line must be stranded and recoiled and thru the use of dead blocks for take-ups, it is possible to produce at very little extra cost a sized wire off the cleaning line instead of a coated rod and thus increase production on existing wire mills or provide a finished product ready for shipment.

Based on the above assumptions and other operating factors, the following description outlines our choice of a proposed blast cleaning installation and its various equipment components required to produce a tonnage comparable to our typical acid pickle installation.

* * *

It will consist of 4-2 strand lines at the feed end comprising welding, pay-offs, leveling and blast cleaning. After cleaning, the 8 strands of rod will be guided by sheaves into a common coating and drying section and then guided by sheaves into 8 dead block take-ups for discharge onto high hats as drawn wire or coated rod.

1. Pay-Off and Welding Equipment

There will be 4 stations required, each equipped with a mobile welding machine and 2 flipper type pay-offs.

* * *

The 8 pay-offs will be 3 arm flipper type revolving about a center support and designed to flip all sizes of rod 1/2" dia. and under at 300 F.P.M. Each arm will be sized to hold 3,000 lbs. of rod and will be equipped with adjustable retarders to ensure single loop pay-off.

* * *

The welding machines will be a special type capable of welding rod 1/2" dia. and under. They will be equipped with annealing and trimming facilities and will be mounted over the pay-offs on an adjustable support arranged to give easy access to coil ends at all 3 flipper arms of each pay-off. There will be one welder at each of the 4 stations. As an alternate, but not as efficient, floor mounted mobile welders may be used.

* * *

Since the welding and pay-off is the crucial operating factor in the line, the equipment must be designed to fulfill the following timetable:

(a) **Each pay-off holds 9-1,000 lb. coils of average 3/8" dia. rod requiring 79.74 min. to pay-off.**

(b) **There will be 8 welds required on each pay-off for a total of 16 or 32 min. for each station.**

(c) **This leaves a surplus of 47.74 min. to handle incoming stock.**

(d) **If 500 lb. coils are used, there will be required 16 welds in 32 min. or 64 min. for each station leaving only 15.74 min. for handling incoming stock.**

2. Roller Leveler Equipment

In order to efficiently blast clean strands of rod, it is desirable to level the material in both planes and at the same time provide back tension for maintaining strand alignment thru the blast cleaning and coating equipment.

* * *

The roller levelers will consist of a 5 roll adjustable unit for each strand in the horizontal and vertical plane. They will be preceded by a powered pinch roll used only for threading and all units will be mounted on a common base in line with the blast cleaning machine. During operation the pinch rolls, equipped with an overriding clutch, will act as guide rolls.

* * *

Mounted on the base of the leveler, ahead of the pinch roll units will be a standard type of snarl switch for each strand at each station. It is connected to the blast cleaning abrasive control and the dead block take-up drive so that the line will automatically stop in case of a tangle in the rod from the pay-off. The switch will be so interlocked that both strands will stop regardless of which one tangles.

3. Blast Cleaning Equipment

Each of the 4 lines will be equipped with one machine de-

signed to double pass 2 strands under the blast from 3-25 H.P. centrifugal blasting wheels.

* * *

Each of these machines will be alike in design and similar to present 3 wheel machines now on the market except for the following refinements:

(a) At both ends of the machine will be located a system of 36" dia. turn-around sheaves arranged to pass each strand thru the wheel blast zone two times in a horizontal plane.

(b) Each machine will be equipped with a special alloy blasting tunnel thru which the strands of rod pass and into which the 3 wheels blast abrasive. This tunnel, on which patents are being applied for, is so designed that abrasive which misses the work will rebound onto the work and it will also cause ricocheting abrasive to expend its energy by additional impingements against the work, thus increasing the over-all efficiency of a minimum volume of blasted abrasive.

(c) The 3 blasting wheels on each machine will be designed to provide a blast pattern of sufficient width to cover the work. The abrasive feed to each will have complete volume control designed to regulate the abrasive flow in such a way that maximum cleaning can be obtained with a minimum consumption of abrasive.

(d) All other components comprising a complete machine will be designed similar to those now on the market but in accordance with our special performance specifications for 20 turn operation.

4. Coating Equipment

The 8 strands of cleaned rod from the 4 blast cleaning machines will be sheave guided into a common coating tank. The type of coating and size of tank will vary with the end product of a given application. In the interest of simplicity we are using a medium lime coat for this analysis.

* * *

Blast cleaned rod has a roughened surface and readily picks up lime in quantities sufficient for cold drawing. From actual observation of operating installations, strands of cleaned rod have been coated at 300 F.P.M. in 3 feet of lime bath. However, to be safe we propose a lime tank with 9 feet of bath for a contact time of 1.8 sec. The tank will be wide enough to accommodate 8 strands of rod on 12" centers, and will be equipped with standard means of heating and agitating the lime slurry.

* * *

At the outlet of the tank there will be located compressed air knife jet wipers for each strand of rod to remove the excess lime slurry.

5. Drying Equipment

It has been demonstrated that lime coated blast cleaned rod can be flash dried at 300 F.P.M. in about one sec. Therefore we propose a direct gas fired dutch oven type of dryer 5 feet long and equipped with automatic gas burner regulation which will reduce the heat in case of a strand shutdown.

* * *

The oven will be so designed that each strand will have its own gas burner system baffled off from adjacent strands and electrically tied into the snarl switch control. The rod will be sheave guided through the unit on 12" centers for distribution to the dead block take-ups.

6. Dead Block Take-Up Equipment

The multiple strand installation in Germany as described by Dr. Hans Krautmacher operates at 45 F.P.M. strand speed and utilizes standard horizontal take-up reels at the discharge end.

* * *

This proposed line will be operating at a speed of 300 F.P.M. and in place of take-up reels we are utilizing a standard design of dead block take-up which on demand can be used to size the rod thru a single hole draw for wire production or by die elimination produce cleaned and coated rod.

* * *

There are 8 of these machines arranged at the end of the line to permit straight line sheave guiding of a strand of rod to each for discharge onto mobile wire carriers

7. Finished Product Carriers

The discharge from the dead block take-ups is collected on high hat carriers having a 3,000 lb. coil capacity and designed for lift truck handling. Our estimate includes 16 of these units but this number may have to be increased depending on requirements.

Operation of Proposed Blast Cleaning Line

Although the foregoing description of equipment has given an idea of the sequence of operation, a brief description of the operating procedure will point up the possibilities of this method of descaling and processing hot rolled rod.

* * *

The line is actually a large tonnage single hole drawing operation with the added advantage of being able to operate as a simple cleaning and coating line.

* * *

It is a new conception of a large tonnage cleaning facility and obviously institutes new requirements concerning the scheduling and handling of materials for efficient operation.

* * *

Hot rolled coils of rod will be supplied to the line in accordance with the wire mill's scheduled demand for quantities of sized wire or coated rod.

* * *

The coils are placed on the arms of the flipper type pay-off and the line operators weld the ends to form continuous strands.

* * *

The strands pay off thru the snarl switch into the pinch roll and roller levelers. The pinch rolls act as free wheeling guide rolls except when threading and the roll levelers straighten the rod, provide back tension, and loosen the scale adding to the efficiency of the blast cleaner.

* * *

From the levelers, the rod passes into the blast cleaner for the first pass and then by means of turn-around sheaves is led back to the entrance end and passed thru the blast a second time. This double passing process not only provides the necessary speed of cleaning but it ensures complete cleaning which might now be obtained in a single pass cleaning due to twisting of the rod caused mainly by flipping.

* * *

After the 8 strands of rod have been descaled in the 4-2 strand sections of the line, they are sheave guided into the lime coating tank and then the drying oven to provide a baked-on coat of lime.

From the drying oven, they are sheave guided to the 8 dead block take-up units where the wire is drawn thru a single hole for a maximum of 30% reduction and cast in a continuous flow onto high hat carriers designed to handle 3,000 lb. coils of wire or any other desired weight. If the schedule calls for coated rod, the drawing operation is eliminated and the coated rod is the final product.

Estimate of Equipment Cost

1. Eight heavy duty flipper type pay-off stands	$ 6,000
2. Four heavy duty special overhead mounted welding machines	15,360
3. Four double strand roller levelers with powered pinch rolls and snarl switch	18,000
4. Four heavy dust blast cleaning machines complete with turn-around sheaves, blasting tunnel, electrical equipment and dust collector	100,000
5. One lime tank 14 feet long by 12 feet wide by 4 feet deep complete with sheave strand guides, slurry heating and agitating facilities	4,500
6. One dutch oven complete with baffled individually gas fired sections for 8 strands of rod. The oven will be 6 feet long by 12 feet wide by 4 feet high. It shall be equipped with automatic heat control arranged to lower heat on any one strand of rod which may stop due to breakdown	7,500
7. Eight dead block take-ups designed to draw ½ inch diameter rod and under thru one hole for a maximum of 30% reduction as well as pull the strand of rod thru the cleaning line. If required it must also act as a simple take-up for coated rod	112,000
8. Sixteen high hat wire carriers arranged for lift truck transportation	800
9. One mobile pointer to service the 8 dead block take-ups when change of rod size occurs	4,000
10. One building approximately 300 feet long by 150 feet wide by 15 feet high	200,000
Total Cost of Building and Equipment F.O.B. Manufacturer's Plant	$470,160

Estimated Opertaing Cost Per Ton

1. Pay-off and Welding

	Cost per ton
Direct labor — 4 operators @ $3 per hour	$.444
Direct supplies	none
Maintenance supplies	.020
Maintenance labor	.040
Power	.010
	$.514

2. Roller Leveler

Direct labor	none
Direct supplies	none
Maintenance supplies	.040
Maintenance labor	.070
Power	.010
	$.120

3. Blast Cleaning Machines

Direct labor	none
Direct supplies — abrasive consumption 5 — lbs. per wheel per hour	.303
Maintenance supplies @ $1.50 per hour	.055
Maintenance labor @ $1.50 hour	.055
Power — 225 KW @ 1c per hour	.083
	$.496

4. Coating and Drying

Direct labor	none
Direct supplies—lime, steam & water	.047
Maintenance supplies	.040
Maintenance labor	.070
Power	.018
	$.175

5. Dead Block Take-ups

Direct labor — 1 operator @ $3 per hour	.111
Direct supplies — draw dies	.300
lubricants	.100
Maintenance supplies	.050
Maintenance labor	.070
Power — 8 — 75 HP = 450 KW @ 1c = $4.50 per hour	.166
	$.797

6. General Service

Direct labor — 2 tractor operators @ $2.75 per hour = $5.50	.203
Direct supplies — tractor expense — gas & oil	.018
Maintenance supplies	.062
Maintenance labor	.125
Power	.010
	$.419

Total Cost Per Ton for Sized Wires	$2.52
less Total Cost Per Ton for Dies and Lubricants	.40
Total Cost Per Ton for Coated Rod	$2.12

Conclusion

Any analysis of this type must be based where possible on equal and consistent factors in order to present comparable production and cost data. In line with this reasoning we have purposely reduced our cost figures to the lowest common denominators.

* * *

Comparing the results of the foregoing analysis we find the following fulfills our stated objectives:

1. Hot rolled rod of all sizes can be acid pickled and lime coated at a rate of 24 tons per hour at an average cost of $2.49 per ton.
2. The estimated cost of acid pickling equipment and building is $600,000 F.O.B. manufacturer.
3. Hot rolled rod ½ inch dia. and under can be blast cleaned and lime coated at the rate of 27 tons per hour for $2.12 per ton.
4. Hot rolled rod ½ inch dia. and under can be blast cleaned, lime coated and drawn to wire at a rate of 27 tons per hour for $2.52 per ton.
5. Rod sizes above ½ inch dia. must be blast cleaned in line with manufacturing operations or thru special arrangements of equipment in one of the four high speed lines for slower single pass cleaning of these sizes.
6. The cost of blast cleaning equipment and building is $470,160 F.O.B. manufacturer.

* * *

Obviously the cost data given above does not reflect a complete over-all cost and thus must be augmented by the following items:

1. *Indirect Labor, Overhead and Fixed Charges*
   These costs vary widely due to the many different methods of cost accounting and therefore it is suggested that you calculate these items using your method and add them to the operating cost data of both methods of cleaning.
2. *Acid Disposal*
   Most mills utilize one of the following methods of disposing of acid wastes and should add this item to the operating costs for acid pickling:
   (a) Dilute with water or mill wastes and dump into the sewer system.
   (b) Neutralize with lime in special equipment and dispose of the products of reaction.
   (c) Operate an acid recovery plant.
   (d) Contract to have the waste pickle liquor removed by an outside company.
3. *Virgin Metal Loss*
   It is generally conceded that acid pickling removes an important weight of metal along with the scale. We have not been able to determine any exact amount for rod pickling but according to Dr. Krautmacher it can vary from 2.2 to 5 lbs. per ton. We suggest that 3 lbs. per ton be used and its value be credited to blast cleaning.

* * *

There are many variations which can be made in a blast cleaning plant as described in this paper to facilitate the production of a particular line of finished products.

* * *

Special study of each adaptation of the process and careful planning of equipment design and its final

(*Please turn to page* 1460)

We invite you to see the exhibit of new developments in Acrometal's growing line of wire packaging equipment, and talk with us about our new Take-ups, Powered Let-offs, Accumulators, Brazers, Reel-less packages and Non-returnable Reels. One hint of special interest: Our new Electronic Synchronous Traverse . . . ask us about it! Some of these developments may surprise you, and some may be just what you need to solve your problems.

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Carbon Block Brazing of Stranded and Solid Copper Wire

by Maurice G. Steele, President
M. G. Steele Company
Rome, New York

The precise origins of carbon block brazing are a trifle obscure, but the process quite probably does not date back much more than 30 or 35 years. In this period several wire manufacturers in this country have made use of this process in some form or another, although very little commercially available equipment has been on the market until the past two or three years.

* * *

One early type of electric brazer consisted of a flat, electrically insulated carbon block which was connected to one side of a high current, low voltage line. A pair of insulated pliers was connected to the other side. A small amount of finely divided silver solder was placed on the surface of the carbon block and a similar quantity of flux.

* * *

A braze was made by grasping one of the wire ends in the pliers. Both ends were moistened slightly which permitted picking up the required amount of flux. With the current turned on, the free end was allowed to make contact with the carbon block and a small amount of silver solder was edged up to a point adjacent to the wire end. The wire end which was held in the pliers was next allowed to make contact with the carbon at a point directly opposite the other wire end. This closed the circuit and produced the necessary heat for a braze. The principal limitations of this method are the obvious difficulties of getting good butted alignment and of controlling the braze diameter.

* * *

For several years the possibilities of using mechanically opposed carbon electrodes which are heated by their resistance to the passage of low voltage electric current have attracted the attention of the wire industry. Tools and devices employing such electrodes have been used increasingly by radio, electronic and electric equipment manufacturers for making connections with soft solder and to a lesser extent with silver solder which is sometimes known as hard solder.

* * *

Somewhere along the line the idea of introducing indexing wire grooves into the two opposed electrodes came into the picture and from this concept, coupled with the use of small slugs or pellets of silver solder, has emerged the modern technique of carbon block brazing.

* * *

The writer's connection with this type of wire joining dates back to April, 1953 at the research center of an upstate New York wire and cable group. This company had obtained a large contract for furnishing stranded, bare copper wire consisting of seven strands of .019 wire in long continuous lengths. It was used as conductors in a submarine transatlantic cable. The specifications for this strand were very rigid in several respects, requiring among other things that the individual strands be joined at the strander by electric brazing without the use of flux. The objection to flux was, of course, that any residual flux that was left after the brazing operation might cause environmental cracking of the polyethylene insulation which was later applied. Flux cannot be used with carbon block brazing where wire grooves are used in the electrodes as it tends to collect in and foul up the electrodes.

* * *

The above requirement led to an investigation of carbon block brazing using a silver solder alloy consisting of approximately 80% copper, 15% silver and 5% phosphorous. This alloy has a melting point of 1185° F and a flow point of 1300° F. When used with the carbon block brazer this brazing alloy requires no flux whatever to produce optimum brazed joints. The phosphorous component, under heat, acts as a powerful deoxidizer which minimizes the formation of oxides. In addition to this the carbon electrodes which enclose and surround the wire ends during the brazing process tend, when heated,

Maurice G. Steele

Mr. Steele graduated from the Worcester Polytechnic Institute in 1915 with a B. S. in M. E. He joined Revere Copper and Brass, Inc. in 1929 and later became Technical Advisor of the Baltimore Division. In 1939 he became affiliated with The Kent Company in Rome, where he was Secretary and Factory Manager. In 1951 he was made Chief, Mechanical Section of the Research Center of the Rome Cable Corp., which post he held until 1959.

He is the author of a number of papers on brass and copper and holds some 25 patents, U. S. and foreign, in the fields of heating, air conditioning, mechanical toys, floor treatment, wire processing and electric brazing.

Mr. Steele is a member of the American Society for Metals and The Wire Association.

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 15, 1960 in Chicago, Ill.

to produce a localized reducing atmosphere. This also tends to prevent the formation of oxides. The combination of the phosphorous and the heated carbons, then, provides almost perfect conditions for producing dependable, flux-free brazed joints.

* * *

A successful brazing unit was subsequently developed by the above company and today upwards of ten of these units are in daily use in its plant in stranding, cabling and respooling operations. A streamlined and greatly improved version of the first development brazing units has been commercially available for the past three years and is in use at many wire plants in this country at the present time. Patents covering certain elements of this brazer construction have been issued to the writer and assigned to the beforementioned company.

* * *

A typical carbon block brazer employs two opposed electrically insulated carbon electrodes similar to those shown in Fig. 1. The lower

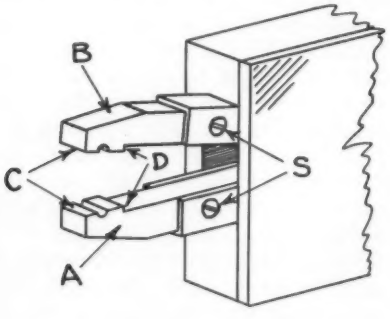


FIG. 1.

electrode A is fixed in horizontal position. The upper electrode B is moveable and may be swung down, usually by means of a foot pedal, to make contact at moderate pressure with the lower electrode as shown in Fig. 2. It will be noted that the electrodes index exactly and are relieved at D so that the contact areas C, C of limited and predetermined size, are provided near the tips.

* * *

The electrodes are initially adjusted by means of the retaining screws S, S so that the contact faces are about parallel to one another in the closed position as

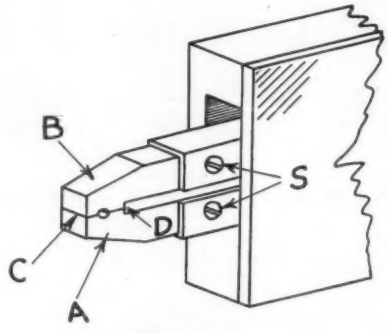


FIG. 2.

shown in Fig. 2. More perfect contact is obtained by pressing the electrodes firmly together and pulling fine emery paper between them as shown in Fig. 3. The paper is reversed several times to cut both faces and make the surfaces perfectly parallel.

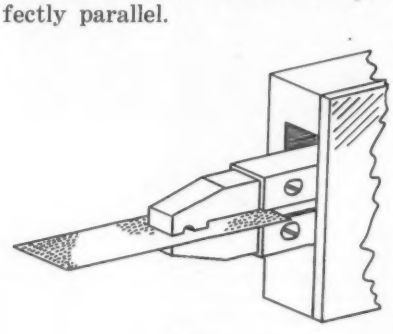


FIG. 3.

Next a twist drill is selected which is one, two or three mils larger than the diameter of the wire to be brazed. Holding the drill in a pin vise, it is inserted between the electrodes as indicated in Fig. 4. It should be held level and at right angles to the electrodes.

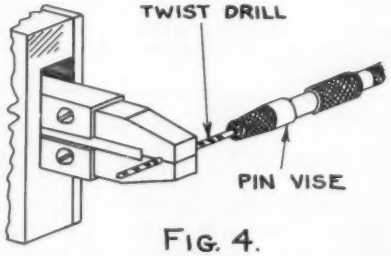


FIG. 4.

With the jaws pressed firmly together the drill should be rotated back and forth until matching, semi-cylindrical grooves are formed in each contact surface.

* * *

Fig. 5 shows a typical, pedestal type carbon block brazer of modern design. The electrodes, which

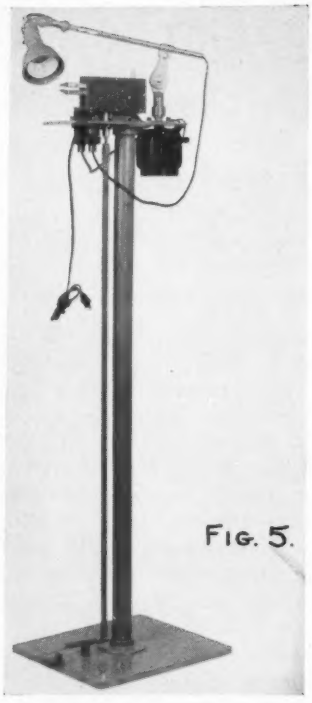


FIG. 5.

are mounted in brass holders of rectangular section, are seen extending from the front of the plastic brazer head which is mounted on a substantial metal table. The upper electrode is operated by the foot pedal and connecting pedal rod which are shown. Also shown is the step-down transformer which is suspended from the under side of the table. An adjustable light is mounted at the rear of the table. This entire unit is portable and may be carried easily from place to place as required.

* * *

The unit makes use of 115 volt — 60 cycle current which is stepped down to 6 or 3 volts by the transformer. This makes available a relatively high current suitable for providing the brazing heat required. It is not necessary to make any adjustments of the electric current for different sizes of wire. The amount of heat supplied to the braze is largely determined by the length of time the current is applied to the electrodes by the operator. This particular units has a wire capacity of from No. 30 to No. 16 wire, both solid and stranded.

* * *

Fig. 6 is a close up of the brazer head assembly and clearly shows the relationship of the various

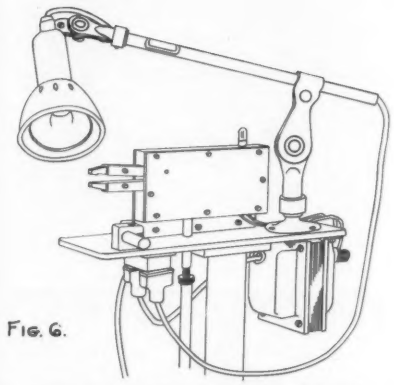


FIG. 6.

components. The inner mechanism provides for a quick closing of the electrodes and for a delayed switch operation after the electrodes are closed. The closing of the switch is indicated by a small pilot light at the rear of the brazer head. The delayed switch action is a very important provision as will be seen later on.

* * *

The carbon block brazer may be adapted to various production operations by supplying special types of frames or chassis but employing the same brazer head and pedal construction. Shown in Fig. 7 is a type of brazer which was produced in 1953. Several of this type were built and are still in daily use. This particular unit was de-

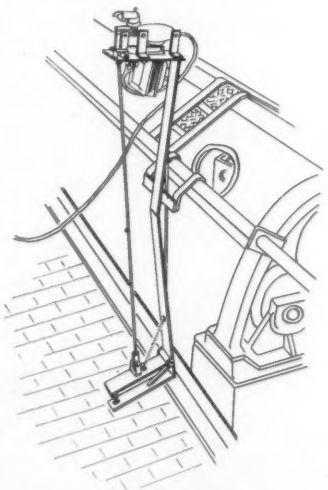


FIG. 7.

signed for use by a strander operator while standing. It is portable but is provided with two hook-type brackets which allow it to be suspended from the tubular horizontal members of the strander frame. This enables the operator to move the unit to any point along the strander where it is needed.

Fig. 8 is an angle-iron frame design which is intended for use by the operator while in a sitting position. It is very mobile, being caster equipped, and is very adaptable for cabling or respooling operations.

FIG. 8.

A versatile and useful design is the new multiple head unit shown in Fig. 9. This is designed for seated operation by the operator, and is really "five brazers in one" having five distinct sets of brazer heads and foot pedals. By grooving

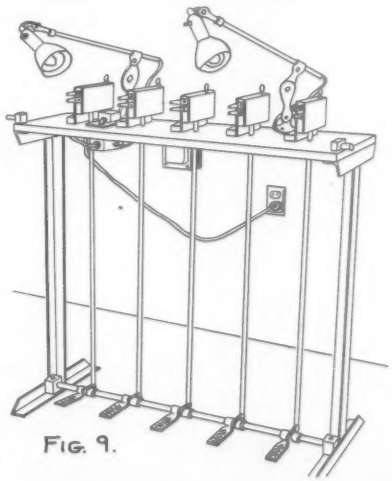


FIG. 9.

the carbon electrodes in each separate brazer head for a different size of wire it is possible to braze five or more different sizes of wire without the necessity of changing the electrodes or altering the size of the grooves. This feature is of great advantage where it is required to braze several different gages of wire at the same location.

* * *

Small pellets or slugs of silver solder are provided in a variety of diameters and lengths so that a suitable size for any style and diameter of wire may be selected. These pellets are free from initial oxide and are usually supplied in plastic vials to keep them clean and bright. They are uniform in size.

* * *

The carbon block brazer is not automatic in operation and depends for its successful operation on the skill and coordination of the operator. For a new operator a short period of practice and experience is usually necessary before optimum brazes are obtained. An operator experienced in flame brazing usually becomes adept very quickly. The brazing operation is a relatively simple one and dependable brazes of high tensile efficiency are not difficult to obtain.

* * *

To make brazed joints a few brazing alloy pellets of suitable size are poured out on the front of the brazer table. For a given size of wire a pellet is usually selected which has a diameter equal to or slightly larger than the diameter of the wire. It should be of sufficient length to provide an adequate amount of braze metal. After a little experience it is a simple matter to select a pellet of proper size. A single pellet is picked up with tweezers and is placed midway in the groove in the lower electrode as shown in Fig. 10. The wire ends are next cut

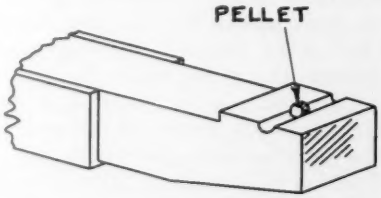


FIG. 10.

squarely. This is very important in making a good butt joint. In the case of stranded wire the ends should be twisted sharply before cutting to length to insure that all strands are securely in place.

* * *

The wire ends to be joined are held in either hand a suitable distance from the ends and are laid in the lower groove on either side of the pellet as shown in Fig 11.

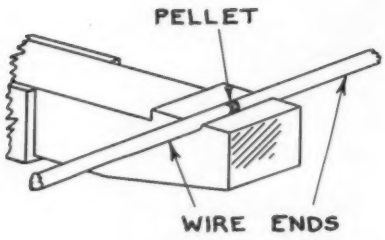


FIG. 11.

The upper electrode is then depressed by means of the foot pedal thus securely locking the pellet and the wire ends in an accurate, cylindrical casing of carbon.

* * *

It is evident that the electrodes now act both as a mold for the braze metal which is soon to be melted and also, quite importantly, as a precise positioner or jig for holding the wire ends in exact, butted alignment. It is also obvious that the diameter of the brazed joint will be limited and controlled by the sized grooves in the electrodes. The wire ends may now be pressed against the pellet from either side. The pellet is locked in place and cannot escape.

* * *

With the electrodes closed, the operator presses the wire ends lightly but securely against the pellet from either side. He then pushes the foot pedal farther down until the pilot light indicates that the brazing heat is being applied. As the carbons become heated and the pellet melts, the operator pushes the wire ends gently together and a brazed joint is made. He can easily sense the melting of the pellet. Soon afterwards (in a fraction of a second usually) he releases the pedal just enough to shut off the heat but not enough to open the electrodes. After just a moment of cooling the foot pedal is completely released, opening the electrodes, and the brazed wire is removed from the electrode grooves.

* * *

Generally speaking solid wire is somewhat easier to braze than multiple strand wire for the following reasons:

1. **In the case of stranded wire the braze metal upon melting tends to "wick" away from the juncture of the two wires by capillarity. This is especially true if the brazing heat is not shut off at just the right moment. This wicking action tends to rob the joint of some of the much needed braze metal and to prevent obtaining a good joint.**
2. **It is more diffiicult to prepare the wire ends and cut them square.**
3. **The wire ends tend to balloon out when pressed against the pellet in the electrode grooves.**

* * *

Most difficult of all is stranded wire that is composed of many fine strands. With such wire the wicking effect is much greater as there is much more total surface for the braze metal to adhere to. It is also more difficult to prepare and manipulate the wire ends because of the flexibility of the wire and the problem of holding its circular shape. Cutting the ends too requires special equipment for holding the wire while cutting. Care must be taken when introducing the wire ends into the grooves not to disarrange the strands.

* * *

A very useful and important rule to follow with carbon block brazing is to **avoid overheating.** When the brazed joint is overheated, excessive annealing ensues and, in the case of stranded wire, an undesirable loss of brazing metal by capillary wicking takes place at the juncture of the wire ends. Also the length of stiffened section is increased. After a little experience the operator will develop judgement in the matter of applying just the right amount of heat and good brazes will result.

* * *

In addition to copper wire it is possible to braze copper strip and ribbon by this method as well as brass and other alloys of copper.

* * *

Four typical brazed joints are shown in Fig. 12. From top to bottom these are as follows:

1. **.019 diam. bare solid wire.**
2. **No. 10 bare solid wire.**
3. **No. 18 (7/.0159) tinned stranded wire.**
4. **No. 12 (7/.0305) bare stranded wire.**

* * *

Fig. 13 is a photomicrograph of a brazed joint in a piece of .019 diam. solid copper wire.

* * *

When a carbon block braze takes place the brazing alloy melts and "wets" the surfaces to be joined forming an interfacial alloy therewith. The main portion of the joint is composed of a copper, silver, phosphorous alloy. This alloy is very strong but is relatively hard and on the brittle side. It is not very malleable or ductile. Hence it does not lend itself to reduction as in the wire drawing process. The braze metal remains in the form of a bump which does not deform as readily as the wire. It will tend to snap off when it hits the die. One possible way to have the brazed joint endure the drawing process would be to have a "scanty" braze with a minimum of braze metal.

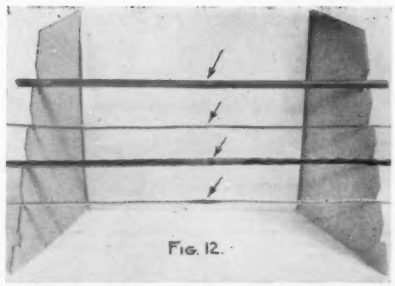


FIG. 12.

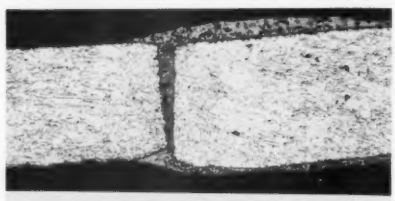


FIG. 13.

* * *

Examples of severe bending of brazed joints in No. 10 solid wire are shown in Fig. 14. In each case there is no evidence of weakness or incipient failure of the joint.

* * *

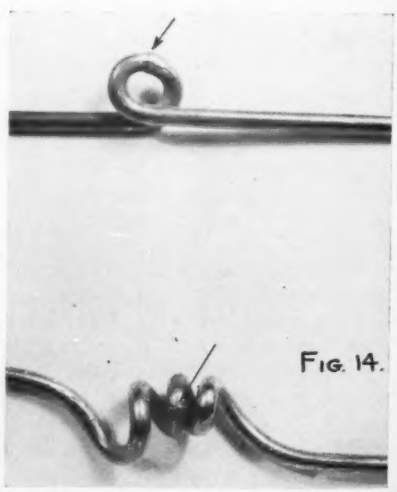


FIG. 14.

The high tensile efficiency of electrically brazed joints in .019" diameter solid wire is illustrated dramatically in the table shown in Fig. 15. This is a tabulation of tensile test results for twenty brazed samples made by the writer as compared with pieces of wire taken adjacent to the wire which was brazed. A total of twenty two brazes was made. Before any tests were made, two brazes were discarded because a visual inspection indicated that they were possibly substandard. As will be seen from the tabulation, the lowest braze efficiency was 96.3% and the average was 99.1%. All samples broke outside of the braze proper.

* * *

Fig. 16 shows a similar tabulation for some samples of No. 22 stranded wire (7/30 — tinned). Here one braze dropped to 87.4%. All others were well over 90%, the average being 94.5%.

TENSILE TESTS OF BRAZED JOINTS

IN STRANDED WIRE - NO. 22 - 7/30 - TINNED

UNBRAZED WIRE

SAMPLE NO.	BREAKING LOAD LBS.
1	22.2
2	22.2

BRAZED WIRE

SAMPLE NO.	BREAKING LOAD LBS.	RATIO %
1	21.1	95.0
2	21.3	95.9
3	21.0	94.6
4	21.1	95.0
5	21.1	95.0
6	21.3	95.9
7	21.1	95.0
8	21.1	95.0
9	21.1	95.0
10	21.1	95.0
11	21.1	95.0
12	21.1	95.0
13	21.2	95.5
14	21.1	95.0
15	21.1	95.0
16	21.1	95.0
17	21.1	95.0
18	21.1	95.0
19	20.2	91.0
20	19.4	87.4
	AVERAGE	94.5

FIG. 16

Brazed joints made with a carbon block brazer are superior in most cases to similar joints made with fluxed braze metal powder in a gas flame. They are more uniform and more dependable. There is less annealing and less stiffening because of the controlled localization of the heat which is possible with the electric brazer. When wires are made with tough pitch copper there is the possibility of some hydrogen embrittlement from the reaction of the gases of the torch flame with the oxygen in the copper. This condition is impossible with electric fluxless brazing.

* * *

Electric brazing is quick and cheap. The time required for making a braze is from 15 to 30 seconds depending upon the nature of the wire to be joined and other conditions. If properly used and maintained, one set of electrodes should last for 500 to 1000 brazes except perhaps for larger wire sizes where more heat is required. The brazing pellets cost a fraction of a mil apiece. The average cost of a single braze aside from labor and overhead will be approximately 1/3 of a mill which is practically negligible from a cost standpoint. Experience has shown that the brazing units themselves require a minimum of maintenance and usually go for months without any mechanical attention. All of the parts are readily accessible, adjustable, and replaceable.

* * *

At the present time the appraisal of welded joints is largely made, aside from visual examination and photomicrographs of joint sections, by means of tensile tests. One exception to this is the quick and practical operator's test of running the brazed joint back and forth around a ½" diameter hardened steel mandrel which is usually attached to the brazer table. This 180 degree bending will usually show up a defective braze and is non-destructive. In fact this test will increase the tensile strength of the brazed joint by hardening the annealed sections adjacent to the braze. When a defective braze is detected by this test the operator should cut it out and make another braze.

TENSILE TESTS OF BRAZED JOINTS

.019 DIA. SOLID COPPER CONDUCTOR

SAMPLE NO.	BREAKING LOAD UNBRAZED WIRE	BREAKING LOAD BRAZED WIRE	RATIO %	DIAMETER OF BRAZED JOINT
1	10.8	10.4	96.3	
2	10.9	10.65	97.7	
3	10.8	10.8	100.0	
4	10.7	10.7	100.0	
5	10.9	10.9	100.0	
6	11.1	10.9	98.2	
7	11.0	10.7	97.3	
8	10.9	10.9	100.0	
9	10.9	10.9	100.0	
10	11.1	10.9	98.2	.0198 - .0208
11	11.0	10.9	99.1	.0197 - .0201
12	10.95	10.9	99.5	.0200 - .0208
13	11.0	10.85	98.7	.0198 - .0203
14	11.0	10.85	98.7	.0214 - .0217
15	10.9	10.85	99.6	.0198 - .0212
16	11.0	10.9	99.1	.0199 - .0202
17	10.95	10.9	99.4	.0200 - .0201
18	10.9	10.9	100.0	.0198 - .0201
19	10.95	10.85	99.0	.0205 - .0211
20	10.95	10.9	99.5	.0198 - .0208
		AVERAGE	99.1	

FIG. 15

* * *

One well known wire and cable company feels that tensile tests are not necessarily indicative of the quality of a brazed joint. In addition to tensile tests they subject samples to a torsion test employing a hand operated torsion tester similar to that shown in Fig. 17.

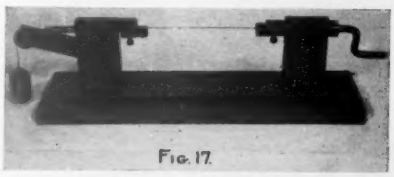
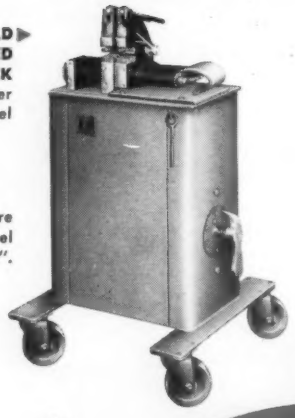


FIG. 17

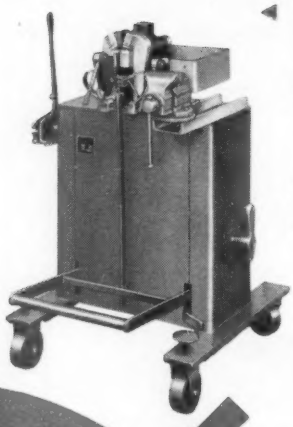
A five inch span of wire, with the brazed joint located at its center, is installed in the two horizontal jaws. The left hand jaw is re-

(*Please turn to page* 1456)

MODEL T-HD MICRO-WELD BUTT WELDER MOUNTED ON 4-WHEEL TRUCK
Capacity ⅛" to ⅜" Diameter
Low and Mild Carbon Steel

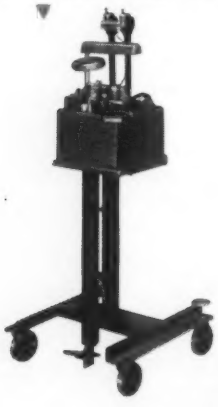


MODEL "J"
available in three models:
J-45-S, J-5-S and J-6-S
for welding high and low carbon STEEL wire, sizes from. 060" to .375".

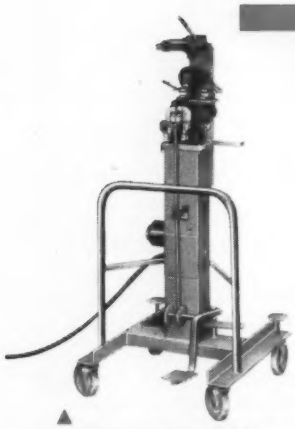


MODEL E-1-S MICRO-WELD BUTT WELDER. MOUNTED ON 4-WHEEL TRUCK
Capacity .010" to .062" diameter high and low carbon steel wire, and alloy wire (thermocouple).

MODEL S.E.M.T.
For Welding All Types of Fine Wire Aluminum, Copper, Brass, Bronze, Steel and Steel Alloys, sizes .005" to .020".

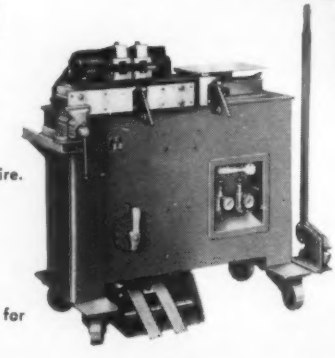


RESULTS of our CHARTER MEMBERSHIP in the WIRE ASSOCIATION

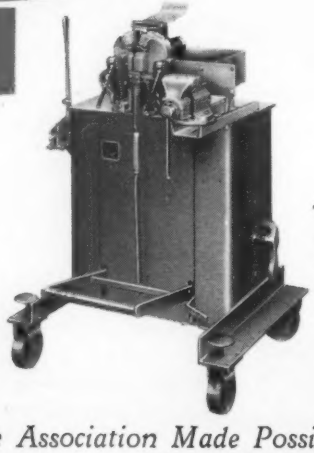


MODEL J-3-S WELDER
Capacity .020" to .080" diameter.
MODEL J-4-S WELDER
Capacity .040" to .160" diameter.
Steel, Steel Alloys, & Thermocouple Wire.

MODEL E-1-C MICRO-WELD BUTT WELDER MOUNTED ON 4-WHEEL TRUCK
Capacity .015" to .050" Dia. Copper —Copper Alloy and E.C. Aluminum.



MODEL "AD"
Available in Three Models
AD-3, AD-4 and AD-5
Size Range ¼" to ¾" Diameter for Ferrous and Non-Ferrous Metals.



Available in four Models—
MODEL J-45-C —.080" to .204" Dia.
MODEL J-5-C —.128" to .257" Dia.
MODEL J-7-C —.187" to .375" Dia.
MODEL J-8-C —.250" to .500" Dia.
for welding Copper, Copper Alloys and E. C. Aluminum wire in sizes from .080" to .500" diameter.

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Properties and Processing of Ethylene Copolymers for Wire and Cable

by

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E. I. du Pont de Nemours & Company

Wilmington, Delaware

W. W. Spohn

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Mr. Spohn, on completion of his Master's Degree in Chemical Engineering at Oklahoma State University, joined the Research Division of the Polychemicals Department in 1948. Since 1955 he has been engaged in the Sales Division as a Wire and Cable Specialist.

This paper was prepared for presentation at the Annual Convention on November 15, 1960, at Chicago, Ill.

D. J. Vaughan

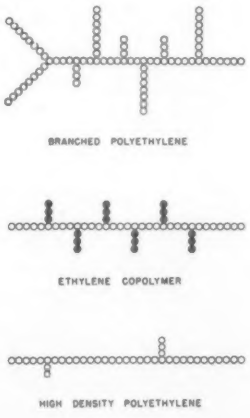
In the past two years many new polyethylene resins have been introduced to the wire and cable industry. Each of these resins differ in some way in architectural design to meet a specific need of the industry.

* * *

The demands on the industry for improved and novel constructions will in all probability lead to the introduction of many more tailored resins. In view of the rapid advances in technology of tailoring resins, we anticipate that the problems of selecting, specifying, and even introducing new resins will become more complex. Since the objective of this paper is to introduce a new series of polymers specifically tailored to meet the needs of the industry, it appears appropriate to illustrate how they differ in architectural design from current resins in the industry.

* * *

The new polymers which we will discuss today are intermediate in density between the branched and high density polyethylenes and combine the best properties of both. The branched polyethylenes which you are most familiar with are a series of ethylene polymers which are randomly branched. They vary in the frequency of branching and in the length of the various branches. (Figure 1). The high density polymers are linear polyethylenes, recently introduced to the wire and cable industry, and can be described in their simplest form as nothing more than a straight carbon chain with a minor degree of random branching. The



MOLECULAR STRUCTURE OF POLYETHYLENE

FIG. 1

intermediate density copolymers get their exceptional solid state properties from the fact that branches are of controlled length and frequency. The length of the branches on the coyolymer chain is principally determined by the monomer which is copolymerized with ethylene. Thus, the copolymers open up a whole new spectrum of polyethylene properties which can be tailor-made for the wire and cable applications. This type of tailoring permits combinations of solid state properties and processing characteristics which have not been offered to the wire and cable industry in the past.

* * *

The electrical properties of all the polyethylene resins are essentially the same since they consist of only carbon and hydrogen. (Figure 2). This is assuming, of course,

FIG. 2

ELECTRICAL PROPERTIES OF POLYETHYLENE

DENSITY	0.920 - 0.945
MELT INDEX	2.0 - 25.0
DIELECTRIC CONSTANT *	2.22 - 2.30
DISSIPATION FACTOR *	< 0.0005
VOLUME RESISTIVITY (D.C.)	$> 10^{17}$ Ohms

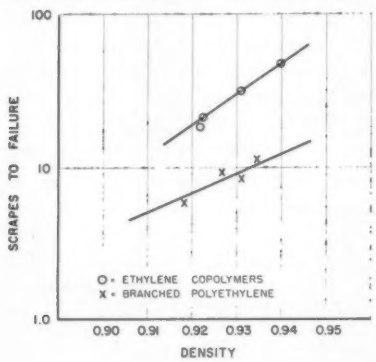
* Test Frequency ... 60 c. to 100 m.c.

that the copolymers and other resins are essentially free of contamination due to the manufacturing process. The dielectric constant, dissipation factor, and insulation resistance of the current and new polymers are all equivalent. It is important to note

that the electrical properties of the copolymers are like the other resins in that they are unaffected by frequency.

* * *

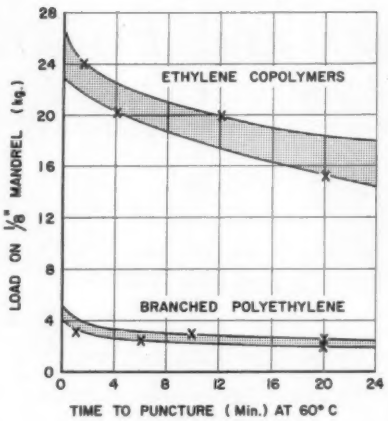
By controlling the architectural design of the polyethylene resins, such as length and frequency of branching, an excellent combination of solid state properties can be achieved. In comparison with conventional branched polyethylenes, the ethylene copolymers are more resistant to abrasion and deformation at temperatures below their softening points. For any given density the copolymer exhibits five times the abrasive resistance of the comparable branched polyethylene as measured by the General Electric scrape test. (Figure 3). The copolymer also resists deformation (Figure 4) to a greater extent at a higher temperature than any branched polyethylene which has been available to the industry. This would be predictable from the fact that the melting point of a copolymer is approximately 5 to 10° C. higher than that of the branched polyethylene at any given density.



SCRAPE ABRASION (GENERAL ELECTRIC) VS. DENSITY FOR BRANCHED POLYETHYLENE AND ETHYLENE COPOLYMERS

FIG. 3

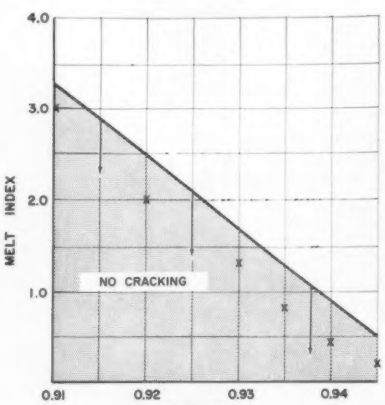
The higher density polyethylene group is marginally better than the copolymer in abrasion resistance and deformation resistance. However, the extremes of these properties represented by the higher density linear polyethylene is only available at a sacrifice in the stability of the polymer against embrittlement at elevated temperatures.



DEFORMATION OF WIRE COATING AT 60° C.

FIG. 4

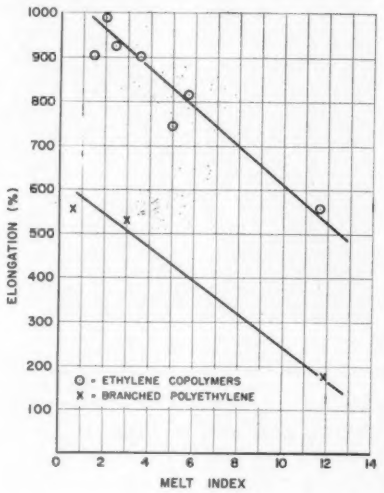
The intermediate density copolymers allow a much greater leeway in both melt index and density, as shown by the area below the line in Figure 5, with stability against thermal embrittlement. Therefore, the wire and cable processors can choose from a series of resins which have the exceptional abrasion resistance, etc., of higher density polyethylene while processing more like branched polyethylene.



PARAMETERS WHICH AFFECT THERMAL STRESS CRACK RESISTANCE OF ETHYLENE COPOLYMERS

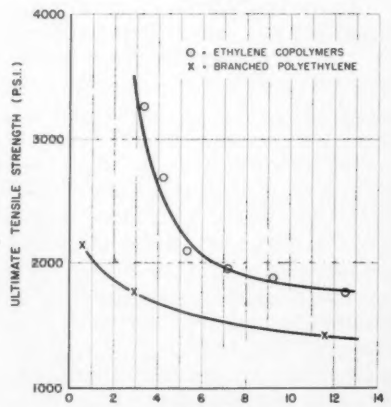
FIG.5

In addition to resistance against thermal embrittlement, the copolymers are excellent in tensile properties. The copolymer elongation is approximately twice that of the branched polymers, when tested according to ASTM D-1248, Type II (Figure 6). Even at this high level of elongation the copolymers retain better than 75% of their initial level after 48 hours at 100° C. The tensile strength (Figure 7) is higher for the copolymers at a given melt index, and the tensile properties are retained after heat aging.



INITIAL ELONGATION OF BRANCHED POLYETHYLENE COMPARED TO ETHYLENE COPOLYMERS

FIG. 6



ULTIMATE TENSILE STRENGTH OF BRANCHED POLYETHYLENE COMPARED TO ETHYLENE COPOLYMERS

FIG. 7

The exceptional solid state properties of the ethylene copolymer should make them of high commercial utility in all insulating applications such as telephone cable, control cable, and power transmission. In order for these resins to be universal in the industry, they must meet two addi-

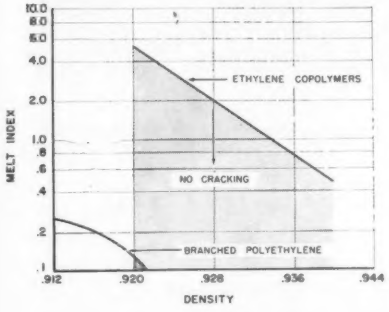
tional requirements to be used as a cable jacket.

1. Weatherability

In accelerating weathering and outdoor exposure tests the copolymers containing carbon black are as stable as the branched polyethylenes. Since branched polyethylene has been exposed as a cable jacket to outdoor weather in Florida for 19 years with no significant deterioration, we expect the same of this new copolymer series when properly compounded with carbon black.

2. Environmental Stress Crack Resistance

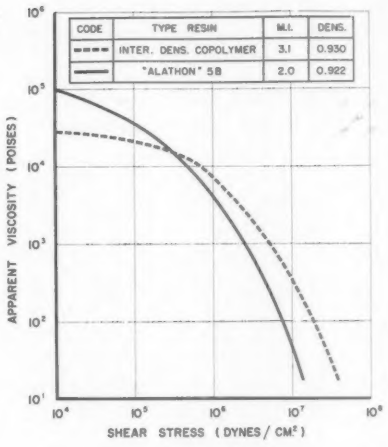
The ethylene copolymers are exceptional in resistance to environmental stress cracking. When tested by the most stringent environment ('Hostepal' at 50° C., after heat aging seven days at 70°C.), the copolymers can be higher in melt index and density than has been possible with either branched or higher density resins. The range of melt index and density possible in the series without failure in 1,000 hours exposure is shown in Figure 8 by the shaded areas. The range of melt index and density possible without experiencing failure in the stringent test permits the selection of resins most suitable for processing and other solid state properties.



STRESS CRACK RESISTANCE
(HEAT AGED 7 DAYS AT 70°C, "HOSTEPAL", 50°C)

FIG. 8

Extrusion trials have shown that the copolymers differ little from branched polyethylene in the equipment and conditions necessary to coat wire. Laboratory data of viscosity versus shear stress (Figure 9) supports the conclusions reached during the extrusion trials. The viscosity of the intermediate density copolymer can be equated to current branched polymers at the shear stress which is normally encountered in extrusion operations. The shear stress viscosity relationship also shows that the two polymers are substantially different in



APPARENT VISCOSITY
VS.
SHEAR STRESS
(CAPILLARY RHEOMETER, L/D=16, 190°C)

FIG. 9

viscosity at the shear stress encountered in measuring melt index. It will, of course, still be true that the higher the melt index of the copolymer, the better it will process compared to another similar copolymer. The equipment, die and core tube designs, are the same for a copolymer as we would recommend for a regular branched polyethylene. A sketch of the die design (Figure 10) which we recommend for standard branched polyethylene is also suitable for use with the copolymers. Extrusion conditions are also similar for a copolymer — with one exception. The stock temperature should be 50 to 100°F. higher and the die setting on the extruder should be set to at least 500°F. Thus, a typical set of extrusion conditions would be as follows:

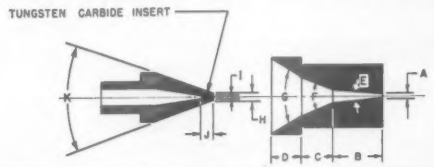
3¼" Extruder
#22 AWG Solid Copper Wire
I.D. of Die: 0.046"
Wire Speed: 2,000 Feet Per Minute
Screen Pack: Two #60's
Temperatures:
Barrel Rear — 500°F.
Barrel Center — 500°F.
Barrel Front — 500°F.
Head — 500°F.
Stock — > 500°F.

* * *

We believe that the properties of the new copolymers are worth having and the processing of these copolymers onto the wire is entirely practical and within the scope of every wire coater. The only problem now remaining is how the end-user and the processor should specify these resins for a given application.

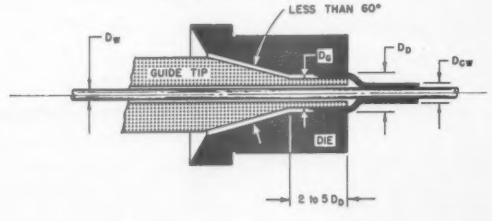
(*Please turn to page* 1438)

"ALATHON" PRESSURE TIP & DIE FOR 2" WIRE COATING CROSSHEAD



WIRE GAUGE AWG.	INSULATION INCHES	A	B	C	D	E	F	G	H	I	J	K
22	0.010	0.046	1.000	0.250		6°	48°	62°	0.050	0.026	1/16	40°

"ALATHON" CABLE JACKETING DIE

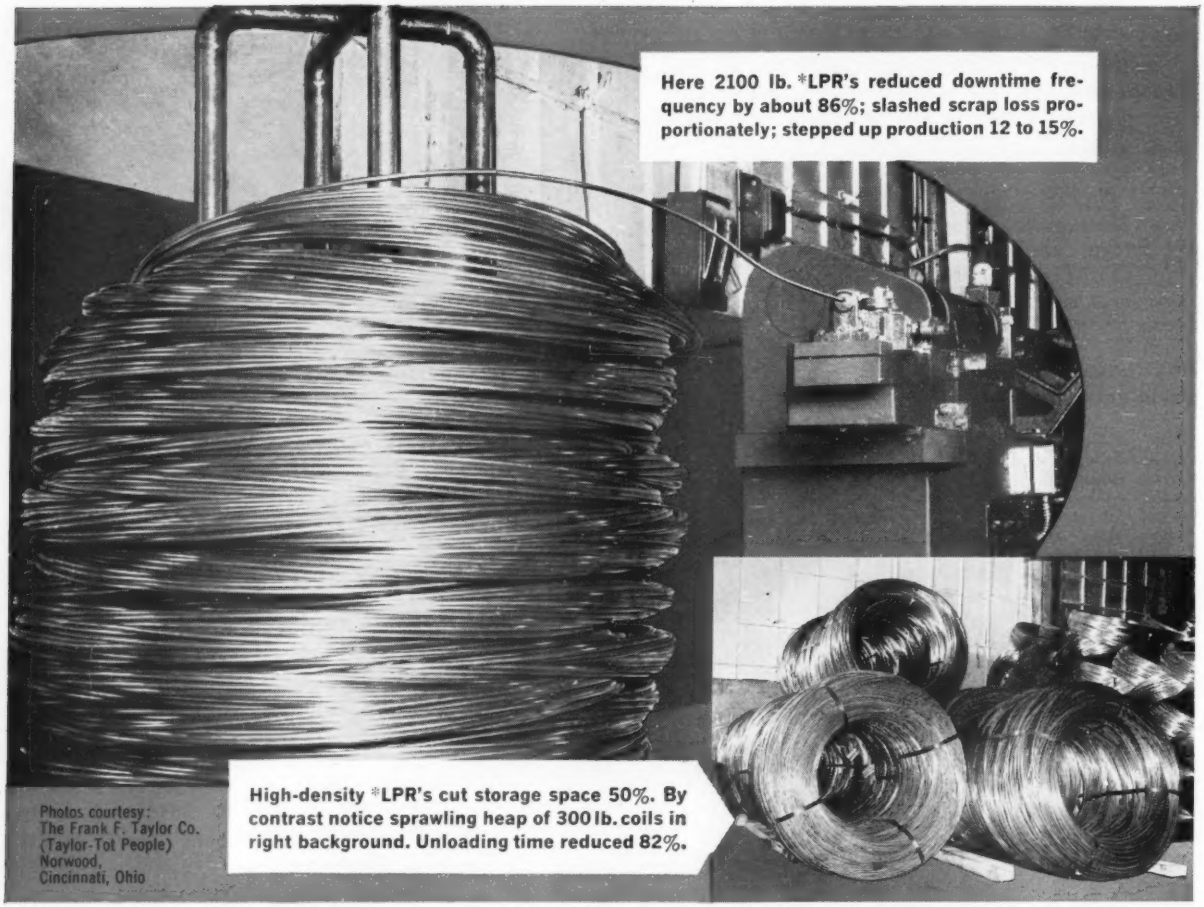


POLISH INTERNAL DIE SURFACE AND EXTERNAL GUIDE TIP SURFACE TO MIRROR FINISH AND BLEND ANGLES SMOOTHLY. VACUUM MAY BE USED BETWEEN WIRE AND GUIDE TIP BUT IS USUALLY NOT REQUIRED.

DRAWDOWN RATIO = $\frac{D_D^2 - D_G^2}{D_{CW}^2 - D_W^2}$ 1.5/1 RECOMMENDED

RECOMMENDED DIE & CORE-TUBE DESIGN FOR ETHYLENE COPOLYMERS

FIG. 10



Here 2100 lb. *LPR's reduced downtime frequency by about 86%; slashed scrap loss proportionately; stepped up production 12 to 15%.

High-density *LPR's cut storage space 50%. By contrast notice sprawling heap of 300 lb. coils in right background. Unloading time reduced 82%.

Photos courtesy:
The Frank F. Taylor Co.
(Taylor-Tot People)
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Brite wire fabricators report these savings from DSC-PORTSMOUTH Long Production Run

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The Manufacture of Telephone Cords

by H. L. Wessel
Department Chief
Cords and Special Processes Department
Western Electric Company
Baltimore, Maryland

When we mention telephone cords most people think of the wires that go from the handset to the telephone, and from the telephone to the connecting block at the baseboard of the home or office. For many years a brown textile braided cover was used on these cords and many of this design are still in use although the design was changed to a black neoprene jacket in 1948. Colored cords with a plastic polyvinyl chloride jacket were introduced in 1954 and most black cords were changed from neoprene to PVC jackets in 1958.

* * *

These cords, which we call Station Cords, represent the largest part of the volume of cords we produce, but many other types of cords are required by the Bell Telephone System such as cords for switchboards, for operator head telephone sets, for many types of test sets, and for explosion proof telephone sets used where the telephone is in an explosive atmosphere. Cords vary in size from a single conductor tipped at each end to the largest which has 200 conductors soldered at each end to miniature plugs which, on one end, are mounted on a frame with additional wires added for cross connections so the cord has 283 circuits. This large cord is used in the 30 button Call Director Telephone Set now offered by the Bell Telephone Companies, which you may have seen advertised in the national magazines such as Life and the Saturday Evening Post. We make over 800 different types of cords; some of which are made in several lengths, and some are made in 13 colors and black.

* * *

Responsibility for the design of cords for the Bell System is assigned to the **Bell Telephone Laboratories,** who maintain a branch laboratory at the Western plant in Baltimore. Engineers from both the Bell Labs and Western are working together to improve the quality and life of cords, and reduce their cost by using new materials and designs, and by improved manufacturing facilities and methods.

H. L. Wessel

The author was graduated from Montana State College in 1932 with a Bachelor's degree in Mechanical Engineering. He was with the Sales Department of Standard Brands, Inc. for five years and then spent 5 years as a Sales Engineer for the Rex Manufacturing Co. of Salt Lake City. In 1942 he became a Process Engineer with the Utah Ordinance Plant which was making 30 and 50 caliber cartridges. He came with the Western Electric Company, Baltimore Works in 1944 and was assigned to the Cord Engineering Department. His work on cords was the development of new designs of tinsel conductors and associated manufacturing facilities, and also the molding of neoprene, rubber, and plastic parts on cords. In 1957 he was promoted to Department Chief "Cords and Special Processes Department."

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 16, 1960 in Chicago, Illinois.

* * *

Western Electric Company uses two basic types of conductors in telephone cords. Those cords which require extreme flexibility and long life are made with "tinsel" electrical conductor. Other cords have a stranded wire electrical conductor where less flexibility can be tolerated and a lower electrical resistance is required. Since the art of making stranded wire products generally is well known, this paper will cover the manufacture of tinsel electrical conductor only.

* * *

The use of metal tinsel as a telephone cord conductor goes back to the turn of the century when Western was developing a telephone cord with a longer life than the stranded wire which was then in use. At that time many Christmas decorations were made with textile threads which were spirally wrapped with a single copper ribbon, which was known as tinsel. Someone conceived the idea of stranding eighteen of these threads together to make a cord conductor. This construction was adopted as soon as it was apparent that cords made with this design would have a life several times longer than the stranded wire design.

* * *

Since that time many design changes have taken place in our tinsel conductor such as the use of a tin-copper alloy instead of copper, the change from eighteen to six strands or threads, each with two ribbons instead of one, the use of tin coated tinsel in cords for the armed services during the war when extreme corrosion was a problem, and more recently the introduction of tinsel conductor with four ribbons on a single textile thread core which is described later in this paper.

* * *

Now we will describe the steps of manufacture of the spring handset cords which are now standard equipment for all new Western Electric telephones and which are gradually replacing the straight handset cords on our older telephones. These cords are made in 13 colors and black to match the sets. The general construction of

to serve the wire industry

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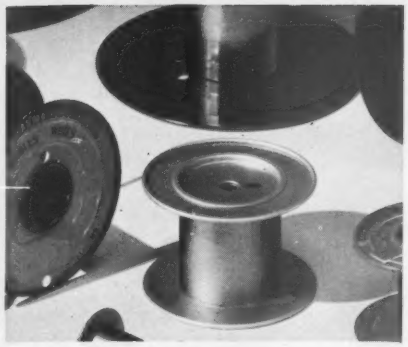

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these cords as shown in Fig. 1 consists of electrical conductors made up of four bronze ribbons wrapped around a nylon center core and then enveloped in a nylon knit covering, which is subsequently insulated with PVC. Two or more of these conductors are enclosed in a PVC jacket. Subsequent to the jacketing operation, cordage is cut to the desired length and the tips and bands are attached to each end of the cord. This hardware facilitates electrical connections in the set, and anchors the cord to the apparatus.

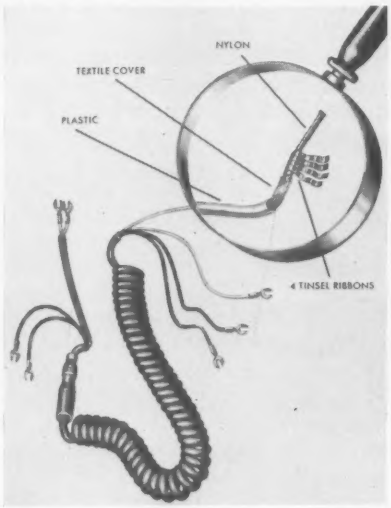


Figure 1. * * * * * * *

The initial step in the manufacture of a cord is the rolling of 37 gage bronze wire into a flat ribbon tape .001″ thick. This is done in one pass at a speed of 1000 feet per minute in a multi-head rolling mill developed by **Western Electric Company.** It has been found that the quality of tinsel ribbon produced on these machines depends greatly on the condition of the surface of the rolls. A highly polished tool steel, centrifugally cast, has been found to give the desired quality of surface on the rolls to produce a satisfactory ribbon. One operator is assigned to 14 rolling heads and produces 600,000 feet of tinsel ribbon per hour.

* * *

The next step in the manufacture of cords is to serve the four tinsel ribbons spirally around a nylon center core. This machine is a Western Electric development and has a unique feature of rotating the center core about its own axis and thereby winding the tinsel ribbons around itself. This feature permits the use of non-revolving ribbon supply spools, so that a more uniform tension control can be applied to each ribbon, which results in a more uniform serving than would be obtained by the usual method which revolves the supply spools of tinsel ribbon about the core in the wrapping operation. One operator on these machines handles 48 spindles and produces 30,000 conductor feet of tinsel wrapped thread per hour. Figure 2 shows a few of the 32 spindles of one machine.

Figure 2. * * * * * * *

The next step in the manufacture of a cord is to envelop the tinsel wrapped core in a nylon knit covering which acts as a strength member for the completed conductor and a barrier between the tinsel ribbons and insulating compound. The knitting machine used in our shops was developed by the Western Electric and has a hollow, cylindrical needle head which rotates about the conductor and applies a spiral knit covering. The main feature of this knitting machine is a "wobble" plate which actuates the needles with a true harmonic motion. This permits higher knitting speeds than the conventional cam actuated needle drives. Each needle is reciprocated 4200 times per minute, while the needle head rotates at 1400 revolutions. One operator is assigned 20 knitting heads, which produce approximately 75,000 feet of knit covered tinsel conductor per hour. Figure 3 shows part of the knit-

ting machines installed at our Baltimore Works.

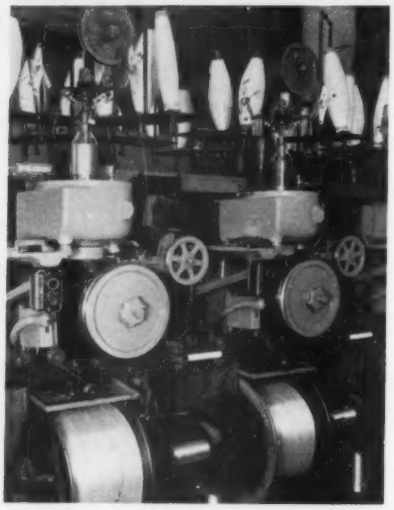


Figure 3.

After the tinsel wrapped conductor is enveloped in a knit covering, it is enclosed in a PVC insulation in order to give it high electrical insulating qualities, even in atmospheres of high humidity. This insulation is applied to the knit covered conductor in a commercial extruder at 1800 feet per minute. Several features have been incorporated in this extruder by Western Electric engineers.

* * *

One of these features is called autogenous extrusion, in that once the extruder is in operation, no heat is added to or taken away from the machine by any outside media, such as electrical heaters or cooling water. The screws of the extruder are designed to develop the desired temperature and plasticity of the PVC compound the instant it reaches the point of application around the knit covered conductor. Another feature of these machines is the use of a drum receiver to take up the insulated conductor. Due to the inherent low breaking strength of the knitted tinsel wrapped conductor, a standard reel or bobbin takeup mechanism is necessarily complicated to adjust for all the variable tensions during operation, particularly when cutting over from a full reel to an empty reel. Pails or drums have been used for some time as process and shipping containers for products such as enameled wire — a relatively stiff material. Western Electric engineers developed the facilities required to fill and empty drum receivers with our very flexible tinsel conductor. The use of drum receivers has eliminated all the problems connected with mechanical drives for reel takeups, has enabled us to increase the running speed of the extruder, and to operate with one operator attending two machines. One operator on two extruders will produce approximately 135,000 feet of insulated conductor per hour.

* * *

The next step in the manufacture of a cord is to enclose a multinumber of conductors in a PVC jacket. This work is done in an extruder which has the same features as those used for insulating, in that the operation is autogenous as far as adding or taking away heat is concerned. Also, the use of the takeup drums from the insulators as a supply for the jacketer has permitted increasing the jacketing speed. Here again, the takeup device for the jacketing machine is a drum receiver similar to that on the insulator. The use of a drum receiver for the jacketed cordage was found to be advantageous to producing coiled cords free from surface blemishes caused by deformation on reel takeups. The one surface blemish that was most prevalent before we started using drum receivers was wrinkles in the spring cord jacket which cracked open after the cord was in service a short time. One operator jackets 17,000 feet per hour of cordage about 3/16″ in diameter.

* * *

The cordage from the jacketing machine is transported in the drums on a roller conveyor to the Artos machines, which automatically cut the cordage to specified lengths and strip the jacket from both ends of the cord simultaneously. The stripping length is determined by interchangeable preset tools and the cutting length is varied by an adjustment of the machine stroke. These machines were developed by the **Artos Manufacturing Company** in collaboration with Western Electric engineers. One machine will cut to length and strip both ends of a jacket from approximately 1550 cords per hour. One operator runs two machines.

* * *

After the cords are cut and stripped in the Artos machines, they are loaded onto dollies which carry them through all subsequent operations, without removal from the dollies. The cords are first moved to a bench-work area where they are prepared for the attachment of the terminating tips, bands, grommets, and other pieces necessary to make a completed cord. The benches in this area are set up for manually threading the grommet to the end of the cord, and manually threading a length of tubing at the handset end of the cord. The grommet performs two functions: it acts as a strain relief between the cord and the handset and also acts as a seal in the transmitter end of the handset to prevent outside noises from reaching the transmitter. The tubing holds together the two white conductors which extend through the handset to the receiver end to facilitate assembly to the handset and prevent the conductors from being pinched under the shoulder of the receiver cap as it is turned into position during assembly.

* * *

After the cord has been partially finished in the bench-work area, it is transported on the dollies to the finishing area where the hardware components, such as tips and bands, are attached by machine operations. These tips and bands are manufactured on standard punch presses. The bands are made two-at-a-time in a punch and die operating at 175 strokes per minute. The tips are made in strip form in progressive type punch and dies arranged so that two strips of tips are produced simultaneously in the same tool. A unique feature incorporated in the design of these tip making tools is a swaging operation whereby a sharp point is formed on the tip tang which must penetrate the tinsel core. This swaging was incorporated to improve the tang penetration of the tinsel wrapped core and also to prevent shearing of the ribbon strands. A second feature of this tool incorporates a coining operation whereby the burr on the shank of the tip is removed to pre-

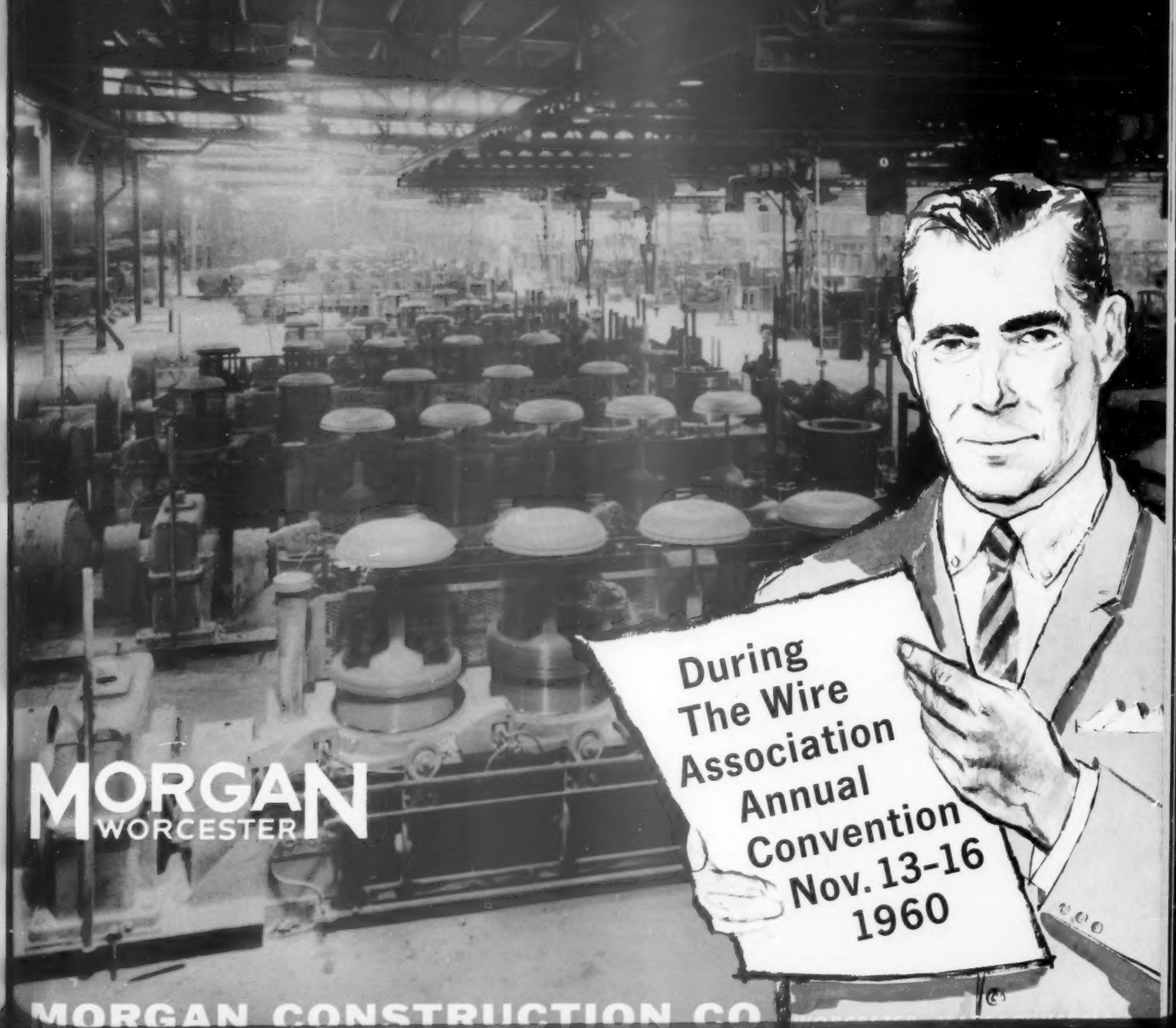
(*Please turn to page* 1450)

see the batteries of

MORGAN WIRE MACHINES

in action at the

REPUBLIC STEEL PLANT



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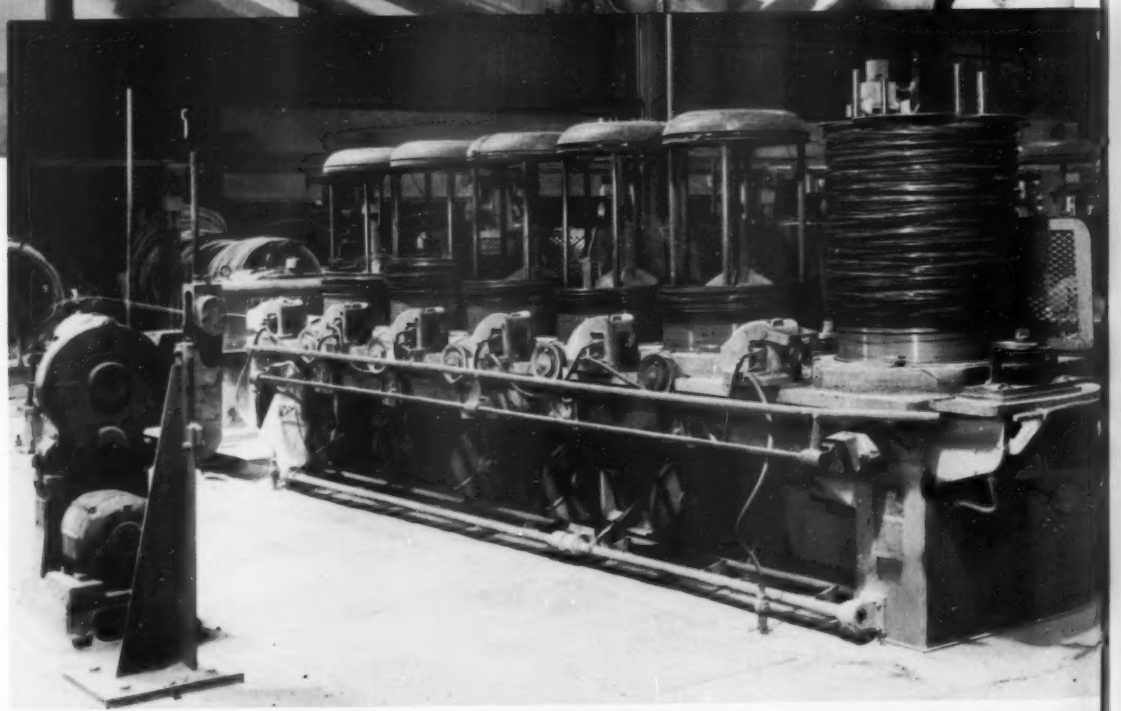
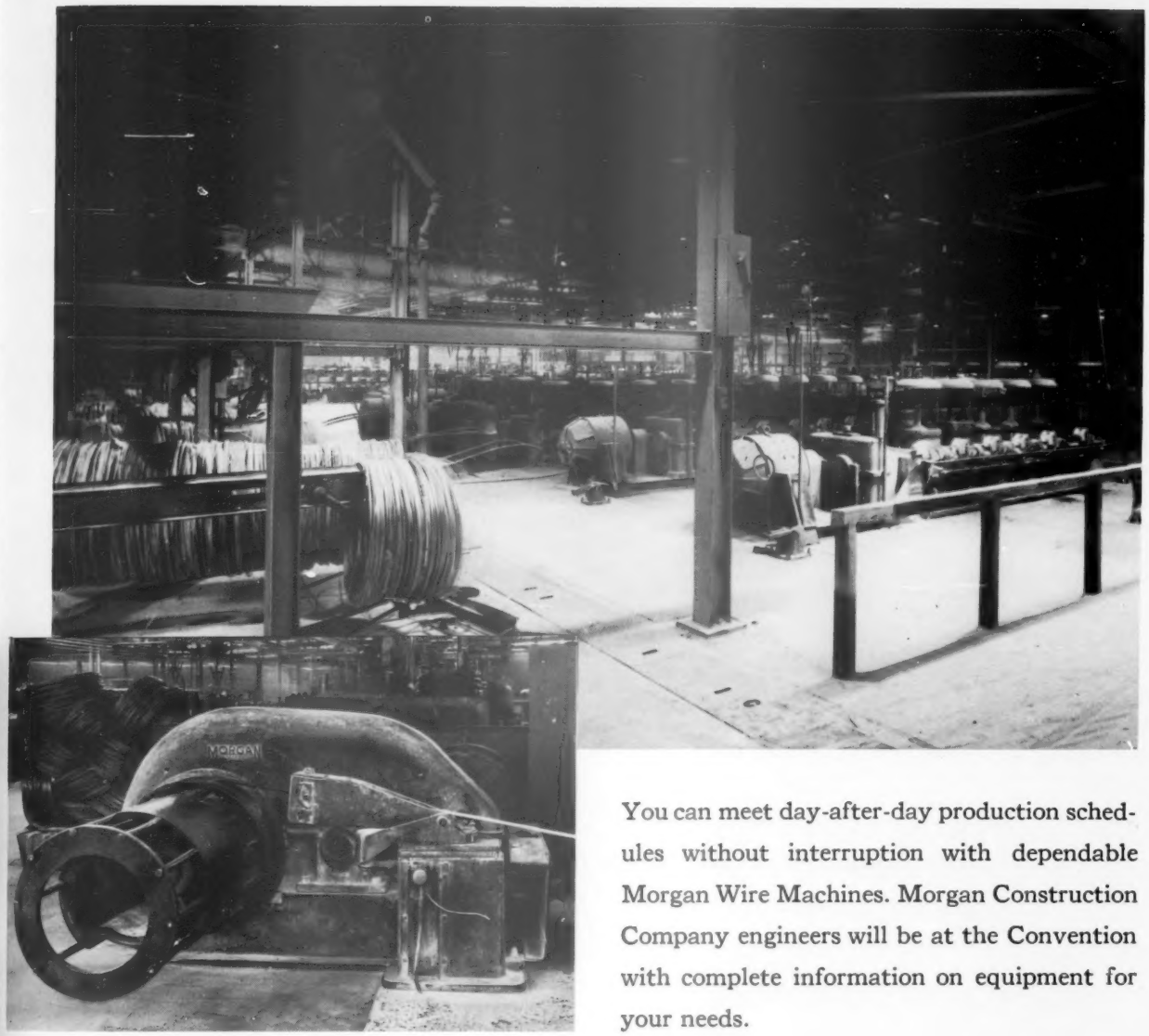


# of Modern Industry . . .

MORGAN WIRE MACHINES



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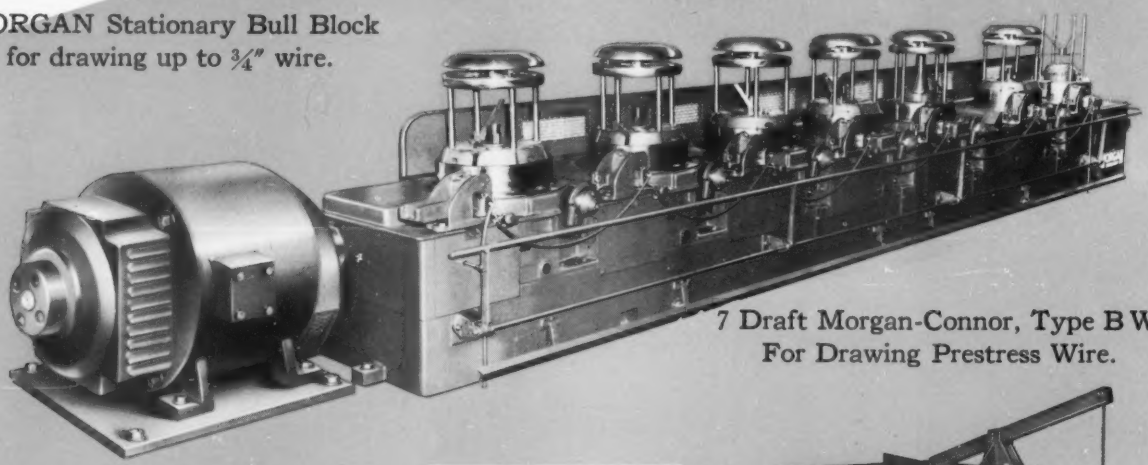

7 Draft Morgan-Connor, Type B W,
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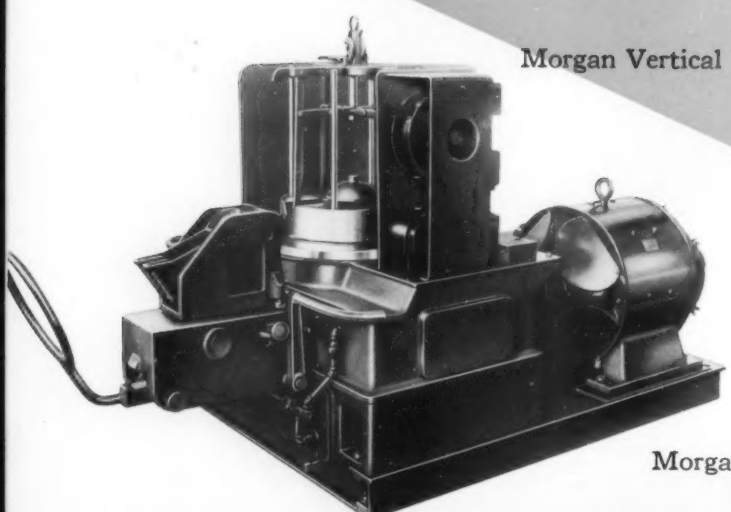
Morgan Vertical Wire Block.



Morgan Dead Block
for Drawing.

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Some Factors Influencing the Performance of Non-Ferrous Wire Drawing Lubricants

by Dr. Robert C. Williams
Vice President in Charge of Research
The Ironsides Company
Columbus, Ohio

Dr. Williams was born in Wooster, Ohio. He graduated from Oberlin College and obtained his Ph. D. degree at Stanford University. Prior to joining the Ironsides Company he was on the research staffs of The Firestone Tire & Rubber Company and Battelle Memorial Institute. He is a member of The Wire Association, The American Chemical Society and The American Oil Chemists Society.

This paper was prepared for presentation at the Annual Convention of The Wire Association on Noverber 15, 1960, in Chicago, Ill.

Over a period of some thirty years observations have been made on the performance of wire drawing lubricants particularly with respect to copper. A theory of the behavior and control of wet drawing lubricants has been covered in earlier papers (1) (2) published in Wire and Wire Products. The object of this article is to point out some basic factors bearing on lubricant performance and the possible influence on the finished product. Some of the factors to be discussed are rather obvious but it is surprising how often they are overlooked considering the great variety of problems that are encountered in a wire mill. Starting with the rod machine and the first die:

(a) the lubricant should not channel,

(b) the lubricant should not be pigmented (contain fine small particles of useful lubricant additives such as graphite, zinc oxide, precipitated chalk, clay, etc.) if the end use of the wire is such that the imbedding of these particles is harmful (for example in enamelling),

(c) the die box lubricant should not adversely affect the wet drawing solution when carried through on the wire or if in some way it leaks into the system.

(d) the lubricant in the die box should be changed when it becomes so loaded with slivers or copper dust that these particles are drawn through the die in appreciable quantities.

Preparation of the Solution

Proper preparation of the rod solution is of considerable importance in dispersing the ordinary paste form of rod compound into a smooth non-lumpy solution. First of all calculate with a reasonable degree of accuracy the volume of solution required by the supply tank for a normal operating level. Calculate the number of pounds of compound to give the required Babcock strength percentage for optimum start-up operation. Your compound supplier can give you the number of pounds of compound required per 100 gallons of solution to attain a stated Babcock percentage. Note that this is 100 gallons of solution rather than per 100 gallons of water alone because your predetermined tank level is calculated on the total solution volume. Pre-mix the required weight of compound in a suitable size tank with at least two times this weight of water using a mechanical agitator and a heat source such as a steam coil. Heat and mix till smooth at a temperature not to exceed 130° F. The use of live steam as a combined heat source and agitator is undesirable because of the possibility of overheating which may cause separation of the fats or oils. The pre-mixed, concentrated, solution may then be drained or pumped into the main solution tank. The main tank should be partly filled with water before the first batch of the pre-mix is put into it.

* * *

Normal additions of compound to maintain the strength of the solution should also be pre-mixed. The practice of adding paste compound directly to the tank or even to the drawing machines should be avoided. To do so often results in slugs of the compound finding a dead spot in the tank and remaining there without contributing to the strength of the solution. It is better to make frequent small additions to maintain strength than large infrequent additions.

* * *

The control of wire drawing solutions dealing with PH, Babcock strengths, surface tension and water conditions have been covered in the previous papers mentioned above.

* * *

In operating a rod machine some operators prefer a solution of fairly high detergency, others prefer a solution which "plates out" the fat to a marked extent. In the latter case it is very important to have a strong jet of solution directed at the die entrances to keep them from loading up with copper dust. A gentle flow of solution will not flush the dies properly.

* * *

It is important to know the throughput of solution per machine so that the main tank capacity is adequate. The tank capacity should be between five and ten times the total throughput of all machines. In addition baffles should be installed in the tank to minimize the recirculation of copper particles. Baffles induce low turbulence areas which promote settling.

* * *

Cooling of the solution is normally required to maintain an operating temperature of 110-130° F. Cooling may be accomplished by several methods such as heat exchangers, immersion of cooling coils in the solution or by cooling by evaporation. The latter method is used by several concerns and simply provides for a forced draft over the solution tanks thereby re-

(*Please turn to page* 1447)

A New Design for Manufacturing Welded Wire Fabrics

by Cecil J. Kinsey
Assistant Chief Engineer
Republic Steel Corporation
Gadsden, Alabama

There are two general types of wire mesh machines in use today: the continuous flow type with welds made while the mesh is in motion and the step by step type which welds when the mesh is stationary, then moves forward to the next cross wire and stops for the next weld.

* * *

There are at least five welder manufacturers who produce the step by step type welders. Until this time, Republic Steel at Gadsden, Alabama, has the only continuous flow type machines in this country.

* * *

One of these machines is a 9'-6" wide welder built in the "twenties" in Youngstown, Ohio, and moved to Gadsden, Alabama, in 1938. This machine is set up on 6" longitudinal wire spacings. Of course the width and cross wire gage has varied. Another machine makes mesh up to 6'-2" wide of any standard gage and wire spacings. These two machines operate at fixed rates of speed. The 9'-6" machine operates at 55 feet per minute at 72% efficiency while the 6'-2" machine runs at 47 feet per minute at 71% efficiency.

* * *

Recently, Republic Steel Corporation designed and built a third continuous flow type machine to produce 13'-0" wide mesh to meet the present market demands. This machine operates within a speed range of 42 feet per minute on large wires and up to 92 feet per minute on smaller gage wires. Any standard wire spacings, even or odd, can be run from 2"x2" to 16" x16".

* * *

Before going into detail I should like to mention at this time that various features of this machine and methods of operation are different from the prior machines and are included in pending application for letters patent.

Cecil J. Kinsey

The author joined Republic in 1947 as a draftsman and later was appointed Chief Draftsman. In March, 1959, he was made Assistant to the Chief Engineer of Republic's Southern District.

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 15, 1960, in Chicago, Illinois.

* * *

To familiarize you with the machine before going into detail, we shall show a movie of its operation.

* * *

Now that we have seen the machine in production let us revert to a few slides to better understand the operation.

* * *

There is a transverse wire storage and feed area composed of 80 "high hat" type reels. Wire can be stacked on the reels by an overhead tramrail crane system or the reels can be transferred from the Wire Mill to the mesh machine storage area fully loaded and ready for use.

* * *

If wire is to be placed on the reels while in operation, a 200# coil will be loaded onto the reel and the end, after being pointed, will be welded by portable welder to the end of the coil that is being processed.

* * *

A tight wire safety device is incorporated. This device stops the welding line when a tangle occurs or if one of the reels fail to uncoil. If this should happen the tight wire will raise a block which trips a limit switch, shutting down the entire line.

* * *

Figure No. 1 — When running the smaller gages of wire mesh the longitudinal wires must be wrapped once around the equalizing drum. This is done to equalize the pull from the welder back to the reels so that one wire does not have more tension that the others. In the larger wires this is not necessary. At this point the wires are also separated to the proper elevation to enter the straighteners. There are 80 longitudinal wire straighteners which remove any kinks in the wire.

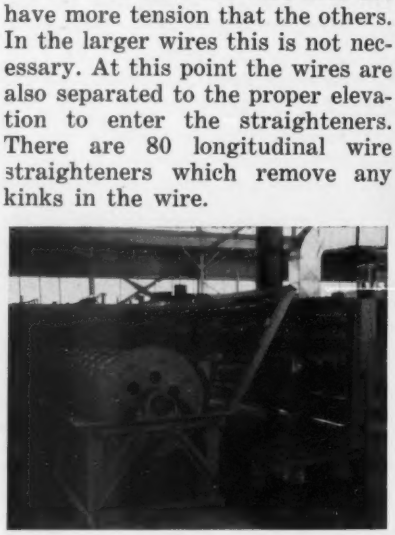

Figure 1 * * * * * * * * * * *

Figure No. 2 — The cross wire feed magazine drops the cross wires on the conveyor. This is done by loading a vertical magazine's leg with cross wires pre-cut and straightened on straighten and cut

Figure 2

machines adjacent to the magazines.

* * *

There is a series of slotted rotating discs that strip the wire from the magazine leg. The depth of the slots is varied according to the gage of wire to be run. The discs are designed to strip the wire and deposit it on the conveyor on the desired centers.

* * *

There are four magazines. No. 1 and No. 2 magazines drop on 6″ and 12″ centers, No. 3 and No. 4 magazines drop on 4″ and 8″ centers. Any standard cross wire spacing from 2″ thru 16″ can be obtained by one of the magazines, or by two magazines alternately depositing the wires onto the conveyor.

* * *

Two-inch spacings can be obtained by No. 3 and No. 4 magazines set on 4″ centers dropping alternately; 3″ spacings by two six-inch magazines dropping alternately; 4″ spacings by No. 3 or No. 4 magazine; 6″ spacings by No. 1 or No. 2 magazine; 8″ spacings by No. 3 or No. 4 magazine; and 12″ spacing by No. 1 or No. 2 magazine.

* * *

16″ spacings are obtained by No. 3 magazine only. An interrupter had been designed to rotate 1½ revolutions to 1 revolution of the magazine. When set on 8″ centers the interrupter will block every other 8″ slot to deposit the wires on 16″ centers.

* * *

The cross wire feed conveyor carries the cross wire from the magazine to the welding drum. The feed conveyor is a 1″ pitch chain with a special lug on every other link (2″ centers) to carry the cross wires. This conveyor delivers the wire to a transfer chain that carries the wire over the welding drum to be welded to the longitudinal wire. A ½″ pitch chain is used here with a special lug every 2″ except when running 3″ centers. Then a transfer chain with special lugs on 3″ centers must be used.

* * *

Figure No. 3 — This is a view taken from the straighteners looking into the entry side of the welder. Here is a bank of 13 transformers. When this slide was made the machine was set to make mesh 12′-0″ wide with transverse wires set on 6″ centers.

* * *

Figure No. 4 — This is a close up view of the welding transformers and lead connections. Also seen in this view are the cooling water connections to the transformers and in the lower left hand corner can be seen the air header to the air cylinders on the longitudinal pinch rolls.

* * *

The longitudinal pinch rolls hold the wire straight and feed the wire into the welder wire guides. These rolls also hold the wire straight so that the signal indicators will ride smoothly. (The series of rectangular flags across the machines).

* * *

If one of the longitudinal wires breaks, the wire runs slack between the pinch roll and welder guides, letting the signal indicator drop down. The flag on the indicator interrupts the light signal which cuts the machine off. The signal indicator can be locked in place when not in use or while threading the machine.

* * *

Figure No. 5 — This is a view from the opposite side of the welder showing the finished product emerging from the machine.

* * *

The maze of pipes seen here are cooling water pipes to the electrodes and air pipes to the hold down cylinders.

* * *

Figure No. 6 — This is a continuation of Slide No. 5. Located on the column at the left are the operator's controls. Reading from the bottom up are the emergency stop, stop, start, jog, the speed rheostat, and the speed indicator.

* * *

Figure No. 7 — This is a view of the welder from the operator's side. The electrodes are held down

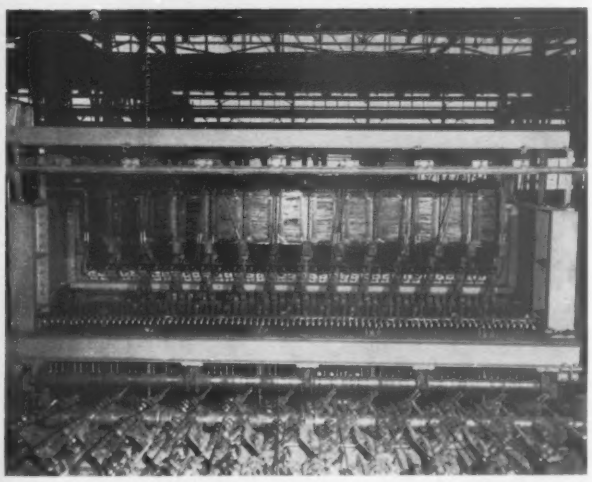

Figure 3

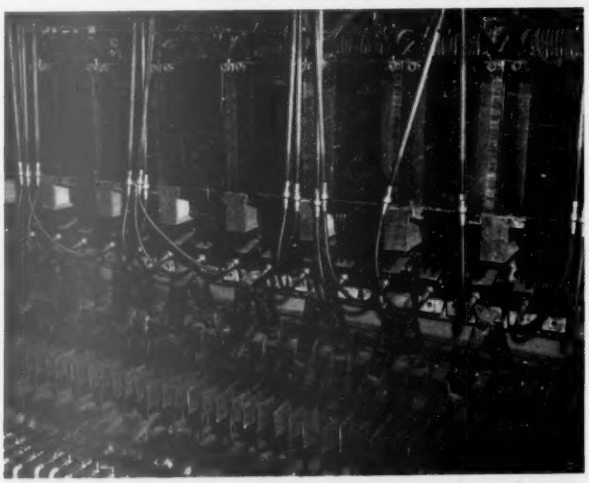

Figure 4

Figure 5

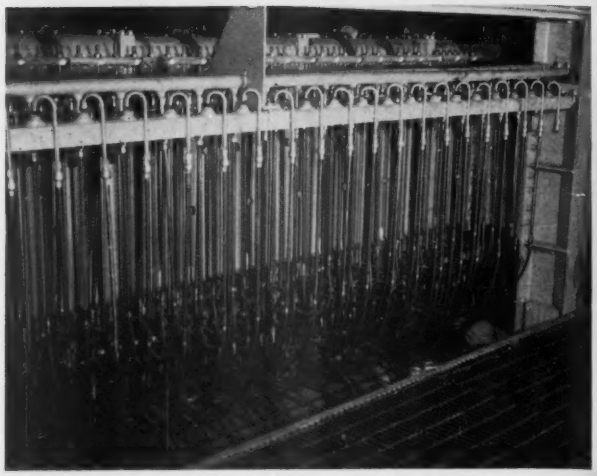

Figure 6

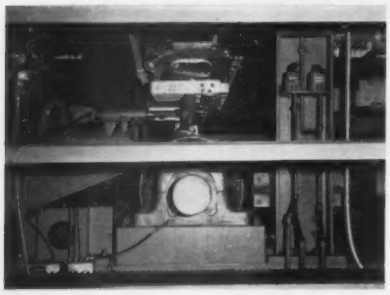

Figure 7

by air cylinders. **The pressure can be varied from 5# to 350#** to accommodate the desired pressure for the various wire sizes.

* * *

A pull rod raises the electrodes and the springs pull the electrodes back against the bumper. **The bumper is driven by a gear motor with an output of 1 R.P.H. This bumper has a movement of 1″ which varies the welding contact over a 1″ surface over the face of the welding tips.**

* * *

The welding operation is more like a walking motion. As the cross wire comes up over the drum the welding contact sets down on the wire. The forward motion of the wire takes the electrode forward. At the proper time the firing mechanism or timing device energizes the transformers to make the weld. The electrodes continue forward until the pull rod raises the electrodes to let the spring pull them back to start the cycle again.

* * *

When manufacturing mesh it is always necessary to have an even number of welding contacts. When making mesh with an odd number of transverse wires it is necessary to pick up the odd circuit by means of a brush. The brush is similar to the electrode assembly in design except for the addition of the welding brush and adjusting rod and the omission of lift rod and tip. This brush assembly can be shifted to any position on the drum to pick up the odd circuit.

* * *

An additional transformer is placed on the welder for use when running the full 13′-0″ widths on 2″ centers. Flexible cable leads are used for connecting the extra transformer to the last electrode assembly and brush assembly. The extra transformer is also used as a spare in case of failure of one of the other transformers.

* * *

The tractor conveyor which you saw earlier in the movie furnishes the main power to pull the wire through the welder.

* * *

The slitter is driven through a gear train off the tractor conveyor. Circular blades are used to trim the selvage on the mesh or slit the mesh. The shears are adjustable in and out by a screw shaft. A scrap car system is provided to remove the barbs.

* * *

A shear is provided to cut the mesh into desired lengths. A counter device is provided to time the operation.

Figure No. 8 — This is a view of the welding tip. Note the barrel shape of the electrode and the symmetric end. The reason for this design is to permit the electrode tip to be rotated and used on all four sides.

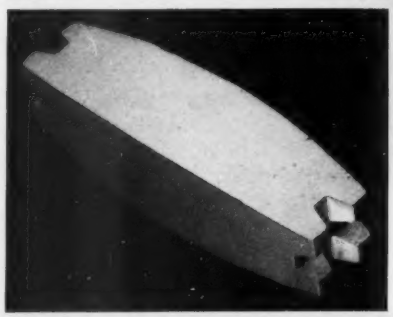

Figure 8

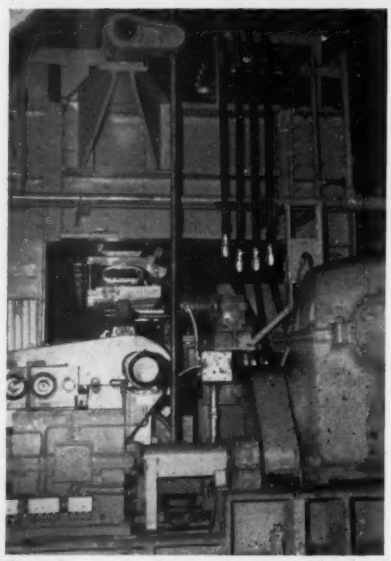

Figure 9

Figure No. 9 — This is the main

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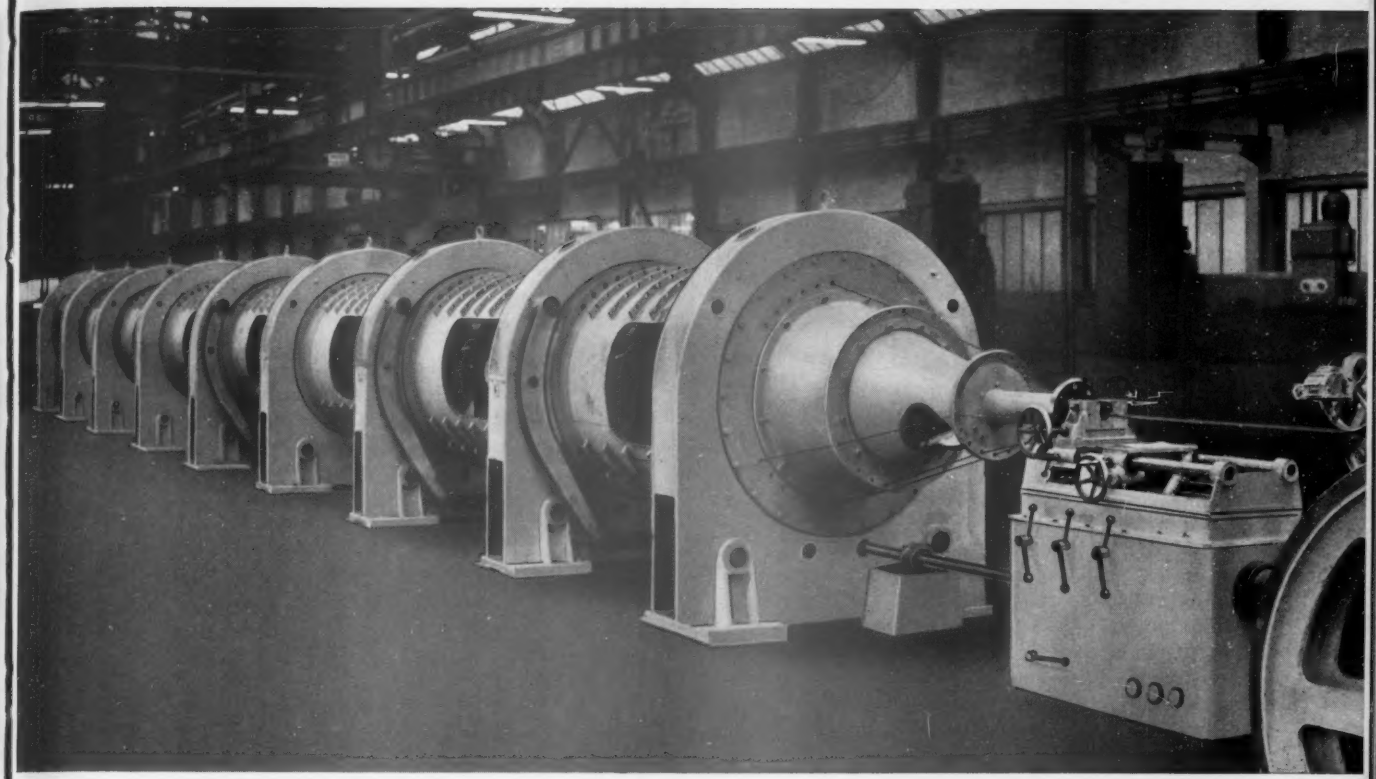

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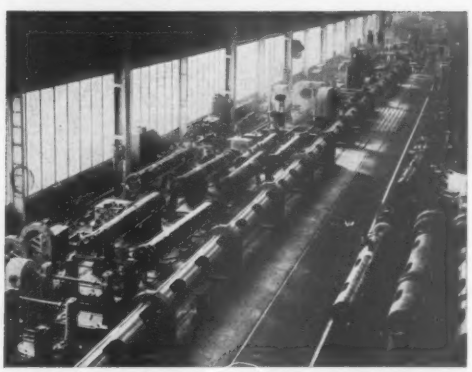

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What is Meant by "Straight Wire"

by Sumner H. Hawley
Chief Engineer
Lewis Machine Company
Cleveland, Ohio

Sumner H. Hawley

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 15, 1960, at Chicago, Illinois.

The author is a graduate of the University of Akron with a degree in Mechanical Engineering and is a Registered Professional Engineer. After short terms of employment with both the American Steel & Wire Division and the Vaughn Machinery Co., he joined The Lewis Machine Co., with whom he has been, except for a period of years during World War II, working with aircraft at the Cleveland Pneumatic Tool Company.

This discussion will concern the straightening of wire taken from coils. We will only touch on the roll straightening method, but elaborate on the Rotary Arbor method. Some of the variations found in straightened wire and their causes will be discussed. As most straightened wire is cut to length, the relation of the cut-off to the straightening operation will have to be shown.

* * *

The act of straightening a bent length of wire is to change the internal stresses so that they are in equilibrium when the wire lies straight. This statement limits the materials that can be straightened to those having some ductility. The material must be able to assume a new shape without fracturing when stressed to reasonable limits.

* * *

Both the Roll and Arbor method of straightening bend and stretch the wire similar to a beam being stressed beyond the proportional limit where the "radius of curvature" is between two extremes, the one exceeding the proportional limit only in the outside fibers; the other full yielding into the neutral axis. The "radius of curvature" necessary to straighten is proportional to the rigidity and size of the material and inversely proportional to the elastic limit.

* * *

The Roll Straightener consists of a series of rolls that are off-set and are, therefore, bending the wire beyond the elastic limit a number of times in two or more planes as the wire runs through. The rolls are adjustable and the straightness obtained depends upon the skill of the operator making the adjustment. This method is generally restricted to the shaped wire.

* * *

The rotary method is generally used on round wire when accurately straightened wire is desired. The Roll Straightener bends a section of wire with one roll and sometime later bends that section with another roll, with straightness depending on the action of the two rolls at different times and in certain directions. Should the wire have a varying twist traveling through, the rolls would be working the wire at different directions and the degree of straightness would vary. Shaped wire will not tend to twist whereas round will.

* * *

The Rotary Straightener rotates around the stock and imparts bending stresses in an overlapping helical pattern that achieves a high degree of straightness in round stock, the principle being that of a beam effect which moves around and along the wire, at the same time producing a helix with a pitch of the longitudinal travel per revolution. The helix or wave disappears when the stress pattern overlaps and straight wire is produced. In this method, all the straightening is done on one section at one time resulting in a positive straightening action.

* * *

The main variations found in wire that has been straightened in the Rotary Arbor are camber, waviness, surface marking, increase or decrease in diameter, spot deformation, a hardening or softening effect, and twisting.

* * *

Camber can be defined as one half the total indicator reading taken at the center of a one foot length of wire supported at the ends. Camber is usually the result of underworking the wire. More offset or "break" will usually produce straight wire.

* * *

Waviness is measured by moving an indicator longitudinally over the wire, thus measuring the distance from the low point to the high point of the wave.

* * *

The speed at which a wire must be run to obtain straight wire depends on the geometry of the arbor and wire. When a wire is bent, bending stresses are created and the stress pattern extends along a certain length of the wire dependent upon the diameter of the wire. Larger wire, naturally, has the stresses extending over a greater length.

* * *

To illustrate assume that a person wants to rough straighten by hand two equal lengths of wire, one 1/32" diameter and the other 1/4" diameter. The 1/4" would probably be bent over the knee several times to make it approximately straight. The 1/32" wire would have to be bent in the fingers quite a large number of times as compared to the 1/4" diameter wire. More bends or stress patterns

(*Please turn to page* 1442)

Some Observations on Pressure of Copper Alloy Extrusions

by Earle W. Lovering
Director of Development Engineering
and
Assistant Technical Manager
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Waterbury, Connecticut

All of our company's copper alloy rod and wire is made by the extrusion process. This process, which produces a high quality product, has supplanted the older methods which were not competitive economically or in the quality of the product. Because we have such a large range of sizes and such a variety of alloys, considerable development work is always underway on extrusion. This brief paper is designed to show you how we learned something about the pressure relationships applying to the extrusion of our alloys.

* * *

Extrusion is a process by which a block of metal is converted to continuous length of uniform cross section by forcing it to flow under high pressure through a die.

* * *

Today the process is used for nearly all common and many uncommon metals. Iron, steel, stainless steel, nickel alloys, copper, brass, aluminum, uranium, zirconium, molybdenum, titanium, etc.

* * *

Its advantages are: 1. Metal is subjected to compression only, except for the friction between the billet and the container and around the die. Even this is only by degree because friction can be lowered and inverse extrusion eliminates most friction.

2. Extrusion is an excellent method for producing finished or semi-finished forms in the wrought condition. It yields high quality products rapidly and economically.

3. It has the ability to make complex as well as simple shapes, hollow as well as solid.

* * *

Our observations here will be concerned only with direct extrusion of copper alloys, but the principles shown are applicable to other metals. Direct extrusion is shown schematically in Fig. 1. As can be seen, the ram pushes a dummy block against the heated billet in the container, thereby forcing the metal to flow through the die. This type of extrusion is customarily used, both here and abroad, for rod and wire extrusion. Inverse extrusion, where the billet has no relative motion to the container, but only to the die, has the advantage of eliminating a large frictional force, but it has never been used to any extent in the U. S.

Earle W. Lovering

Mr. Lovering was graduated from the Massachusetts Institute of Technology in 1938 with a B.S. in Metallurgy. From 1938 to 1946 he was employed in various divisions of Revere Copper and Brass Inc. From 1946 to 1954 he worked for the Seymour Manufacturing Co., Seymour, Conn. Since 1954 he has been with Scovill Manufacturing Co., in Waterbury, Conn. doing metallurgical work for the mills division, where he is, at present, Director of Development Engineering and Assistant Technical Manager.

He prepared this paper for presentation at the Annual Convention of The Wire Association on November 16, 1960, at Chicago, Ill.

* * *

The calculation of pressure or force required for a given extrusion is one of the commonest calculations undertaken by the extrusion engineer or supervisor. Possibly we should say "estimate" rather than "calculation," because the calculations sometimes lack the precision we would like. It is too important, however, to neglect or guess at. Any new size of billet or product, any new or contemplated press equipment, any new metal or alloy, requires that pressure calculations be made to assure a successful, commercial operation without laborious and expensive trials.

* * *

The principal variables in the extrusion process are as follows:

Extrusion Ratio, R, is the area of the container bore divided by the area of the extruded product. For round rod or wire this is:

$$R = \frac{D^2}{nd^2}$$

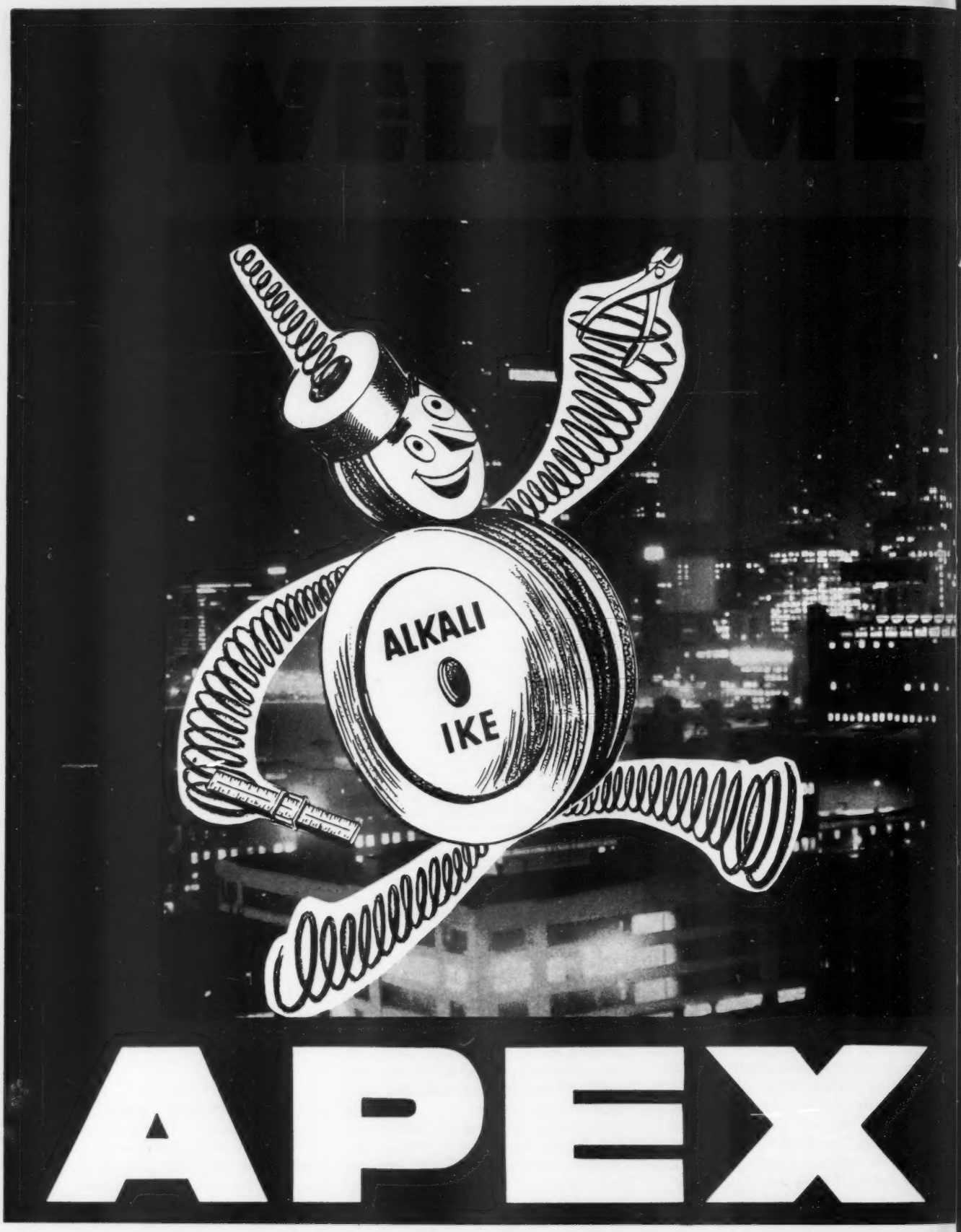
where D is the container bore, d is the rod diameter, and n is the number of holes in the die. Force, F, is the force exerted by the ram, usually expressed in tons. Extrusion pressure, p, is the Force, F, divided by the area over which it acts, i.e. the dummy block area, usually expressed in tons per square inch.

The classic relationship of extrusion pressure to extrusion ratio is given by the formula:

(Eq. 1) $p = k \log_e R$ **where k is an appropriate constant for the metal being extruded, its temperature, and the conditions (essentially frictionless or very low friction) of extrusion.**

* * *

This expression would imply that the pressure during extrusion is constant, because the extrusion ratio does not change during extrusion. In commercial direct extrusion of copper base alloys (and most metals) however, the pres-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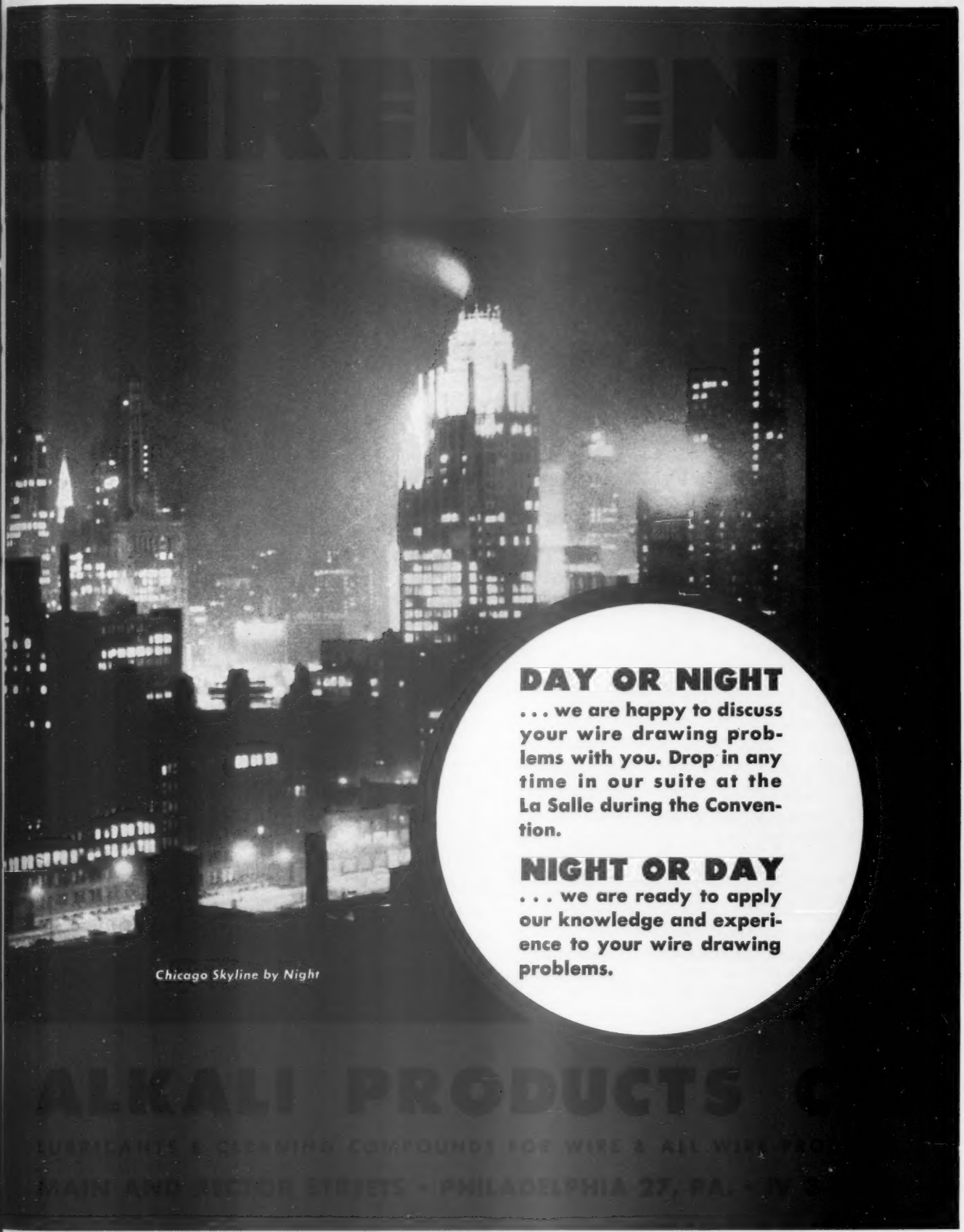
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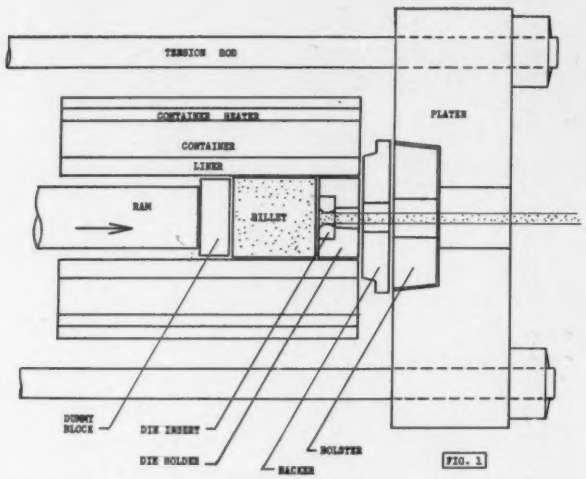
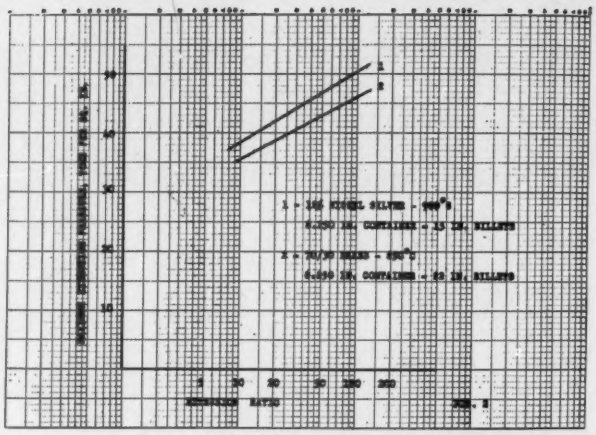
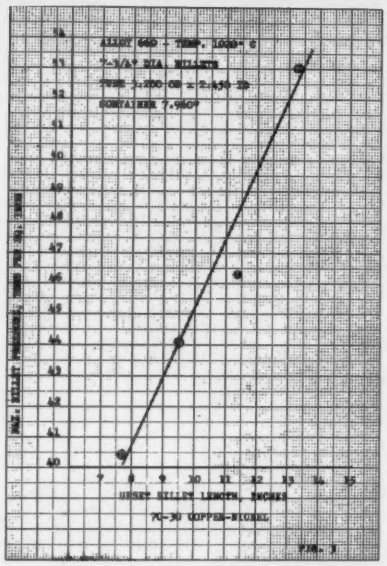
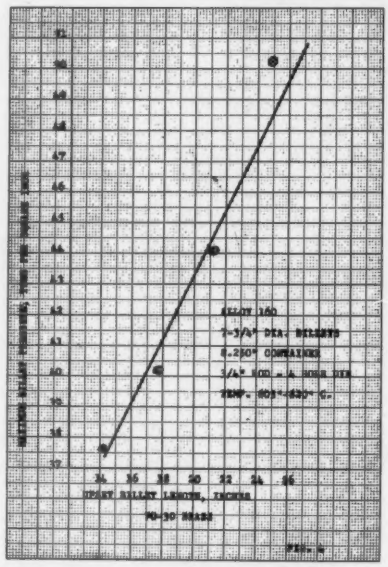


FIG. 1







sure is highest at the start and decreases during the extrusion, but may rise again at the finish of extrusion when the butt has lost temperature and plasticity and the principal metal flow is radially across the die face. It is for this reason that the maximum pressure, i.e. the starting pressure, is of the most interest and importance to the operating man, for if he can start the extrusion, he can usually complete it.

* * *

The force necessary to start extrusion is therefore composed of two components, one to accomplish the deformation and another to overcome the friction. The pressure may be expressed then:
(Eq. 2) $p = p_d + p_f$ where p is the starting (maximum) extrusion pressure, p_d is the pressure to accomplish deformation, and p_f the pressure to overcome friction.

* * *

But we know that the pressure for deformation is proportional to the logarithm of the extrusion ratio. We plotted pressure data at our plant and found that this was indeed so. Figure 2 shows typical curves for two of our wire alloys. It is evident that even if no deformation takes place (extrusion ratio of 1), there is still a large pressure required to overcome friction in direct extrusion.

* * *

Frictional force should be proportional to the cylindrical area of the outside of the billet, which moves along the container bore. It may therefore be expressed as the pressure component of the starting pressure and mathematically:
(Eq. 3) $p_f = C \pi D L$ where C is a constant depending on the alloy, temperature, and type of extrusion (sleeving or non-sleeving); D is the container bore; L is the length of the billet after it has been expanded to fill the container.

* * *

Combining the deformation pressure and the frictional pressure we get:

(Eq. 4) $p = k \log R + C \pi D L$

* * *

If this expression is correct, we should then find that extrusion starting pressure varies linearly with the length of a billet when all other conditions are the same. To test this fact we ran some extrusions using different lengths of billet, but holding all other conditions constant. Figures 3 and 4 show the linear variation of the pressure. Note that these lengths are the "upset" lengths; that is the length after the billet has been upset or expanded to the container bore at the start of extrusion.

* * *

This convinced us that equation 4 was adequate to make our calculations. We then mathematically derived, from our extrusion data, equations for 70-30 cartridge brass and for 70-30 cupro-nickel, two alloys on which we do a variety of work.

* * *

The equation for 70-30 cupro-nickel is:

$$p = 20.2 \log R + 0.0925 \pi DL$$

* * *

This will give the starting pressure in tons per square inch when the billet is heated to 1020° C.

* * *

For 70-30 brass the equation:

$p = 14.9 \log R + 0.042 \pi D L$
gives the starting pressure when the billets are heated to 810° C.

* * *

You will note that we have used the common logarithm to the base 10 instead of the natural logarithm of the extrusion ratio.

* * *

Actually this merely changes the constant k used in equation 1 by a factor of 2.30, the multiplier to convert common to natural logarithms. The former are, of course, much simpler to use and all of our calculations are made with common logarithms.

* * *

Our extrusions of these two alloys are made leaving a "sleeve" by using a dummy block about 1/8" smaller in diameter than the container bore. This sleeve reduces the formation of pipe by preventing the oxidized surface of the billet from being extruded into the rod. The friction component could, in this case, more truly be called a shearing component, but its value is still properly expressed by:

$p_f = C \pi D L,$

although we use the dummy block diameter for D instead of the container bore.

* * *

The data from which these two equations were derived was all taken during the middle of long runs. In this way our pressure values were unaffected by variations in the temperature of the dummy blocks, dies, and container liner. These have a profound effect on extrusion pressures, affecting the billet temperature, the most sensitive factor in determining metal plasticity. Our customary practice is to use a standard number of dummy blocks and dies (of standard profile), heated at the start to a standard temperature, usually 350° C. The container is automatically heated to a standard temperature, also usually 350° C. After a few hours of continuous operation, all of these tools have reached a thermal equilibrium and the extrusion pressure is then dependent only upon the billet alloy, temperature, and size and the extrusion ratio.

* * *

We have successfully used these formulae in computing extrusions on four different pressures, with billet diameters of 7", 8" and 9", and lengths from 10" to 28". The products ranged from 3/4" wire to 3 1/8" tubing and in all cases our calculations have come within 5% of the actual values. We believe this is satisfactory for commercial work, but plan to make further studies in other alloys and particularly in small diameters around 1" to 2" to enhance our understanding of the basic factors governing extrusion pressure.

* * *

What do we do with alloys for which we have not developed such complete equations? We have arbitrarily grouped them into two groups depending on frictional properties. Our grouping, admittedly only relative, is as shown:

Low friction

1. Copper
2. Copper-zinc with less than 16% zinc
3. Copper-tin
4. Copper-tin-zinc with less than 10% zinc and less than 8% tin

High friction

1. Copper-zinc with more than 20% zinc
2. Copper-nickel-zinc with more than 10% nickel
3. Copper-nickel

* * *

Actually this classification is based on the extrusion flow. Alloys high in friction tend to form extrusion "pipe" because the surface of the billet, being restrained by high friction, flows more slowly than the center and eventually folds into the back end of the billet and is extruded at the tail end of the product.

* * *

Low friction alloys do not suffer such billet surface restraint and the outside of the billet tends to become the outside of the product.

* * *

Therefore, based on our mill experience and studies of the flow in sectioned butts, it is relatively simple to make the classification shown.

* * *

On the low friction alloys we can, after getting data from a known extrusion, predict others by:

$p = k \log R.$

We allow 10% for error and have had reasonably good results. We usually are merely figuring other sizes to make from the same size billet, so it is obvious that our calculation is on the conservative side since we are changing the whole pressure to conform to the new extrusion ratio.

* * *

On high friction alloys we assume that half of the total pressure is due to deformation and half to friction. The two alloys whose complete equations we have shown are both high friction alloys and we know that in our commercial operations this relation of frictional pressure to deformation pressure is not too far from the truth. Having made this assumption, we then calculate a new extrusion from known data on an existing operation by changing half the pressure in accordance with extrusion ratio and half in accordance with any change in billet size.

* * *

Our results to date have been excellent, but we still are unsure enough of this method so that we allow 10% for error.

* * *

We have tried to develop a method of predicting pressures which could be useful to the shop man and engineer, yet accurate and scientifically valid. Our results have encouraged us and we plan to do further work in perfecting such calculations.

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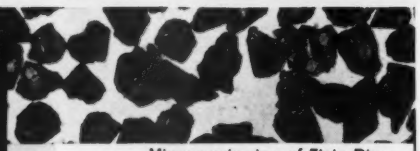

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The Application of Enamel Coverings to Rectangular Copper Sections and Their Specialised Application in the Manufacture of Continuously Transposed Conductors

by J. F. Cowen
Divisional Chief Engineer
Winding Wire Division
British Insulated Callender's Cables Ltd.
Melling, Lancashire, England

In choosing the subject of enamelled rectangular sections and their application in the manufacture of continuously transposed conductors, it is my intention to bring to your notice a development which is proving of growing significance within the transformer industry in Great Britain and to indicate the benefits which have been derived by my Company, as winding wire manufacturers, as a result of entering this field.

* * *

I am aware that the use of continuously transposed conductors is not new. The manufacture and application of the product was, however, restricted to a limited field prior to 1958 when the relevant patents expired. (1)

* * *

The paper is written to bring into focus the winding wire maker's interest in the introduction of continuously transposed conductors rather than the highly specialised field of their application which can be more ably dealt with by the transformer design engineer.

* * *

In the post war years, and in particular from 1954 onwards, there has been an increasing demand within the trade for rectangular conductors coated with thin walled enamel insulations with the result that the larger manufacturers of enamelled wire have devoted much of their development effort to perfecting techniques of enamel application to rectangular copper sections.

J. F. Cowen

Mr. Cowen has been engaged in the winding wire industry for the past thirty years and served with British Insulated Cables Limited until 1945 and later with British Insulated Callender's Cables Limited. His earlier years were occupied as a varnish technologist in the enamelled wire factory of the Company. In 1947 he took over the management of the Company's enamelled wire unit and subsequently spent considerable time on the overseas factory activities of the Company relative to enamelled wire manufacture. Subsequent upon the expansion of the Company's activities and the establishment of production divisions, Mr. Cowen took over the position of Divisional Chief Engineer of the Winding Wire Division, which position he now holds.

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 16, 1960, in Chicago, Illinois.

Specialised consideration has been given to the preparation of copper strip manufactured from electrolytic tough pitch high conductivity copper, free from spills, slivers and copper dust, in order that the thin enamel coatings may be applied free from electrical faults. Shaving at the rod stage prior to drawing has been introduced as an aid to achieving a high surface quality prior to enamelling. The broad range of rectangular conductors likely to be called for required substantial development both in plant design and enamel application.

* * *

Vertical ovens ranging from 20 to 30 feet, in some cases heated electrically and in others by gas, were designed to enable the various heat patterns to be achieved which are so necessary to adequately stove after the removal of the solvents contained in the variety of enamels of which the polyvinyl acetal is to the fore.

* * *

The polyvinyl acetal type of enamel which has retained its popularity over many years is of the high viscosity, low solid content class and its application to the wide assortment of strip sizes likely to be called for presented peculiar problems. The high viscosity of the enamel necessitated die application and numerous types of die have now been evolved which give a uniform coating of enamel to both the flats and the edges.

* * *

In addition to the development work on oven design and enamel application, special consideration had to be given to the design of adequate haul-off gear which would ensure, even for the larger sections of strip, a steady movement through the oven and windings of a high standard.

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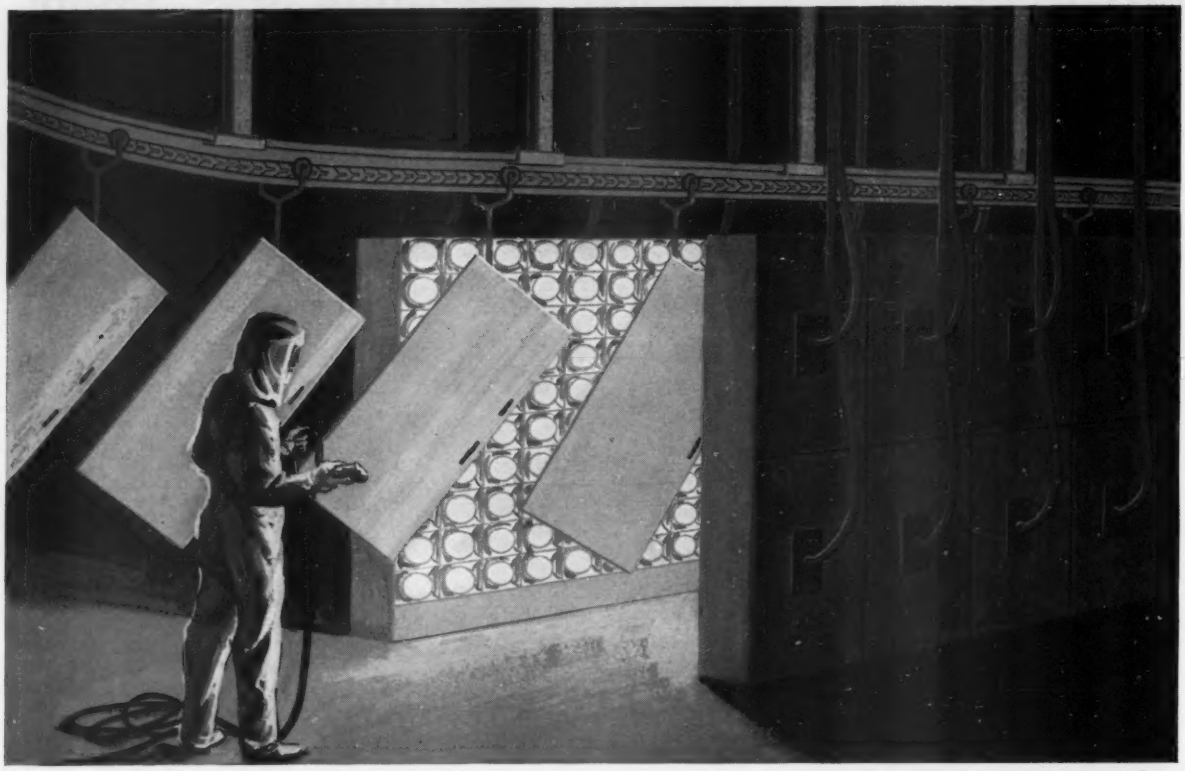

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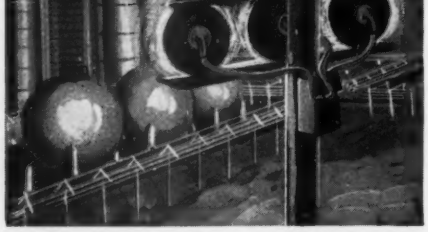

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There was confidence that a fair return for the high development charges incurred in perfecting the technique of enamelling rectangular section, and the high capital outlay necessary to build the multi-head machines, would eventually be earned. Those who are engaged in the enamelled wire industry will realise only too well the economic advantage resulting from lengthy runs of one size of conductor and that frequent size changes increase down time and manufacturing scrap and have an adverse bearing on the economy of the process.

* * *

Insofar as the enamelling of round conductors is concerned, the growth in the electrical industry during the past twenty years has brought about the desired effect and repetitive business in specific conductor sizes and on a considerable scale is now available to the industry. In the enamelled rectangular field however, the pattern associated with round conductors does not obtain. Business is drawn from a more restricted sphere being confined to armature and field coil windings where larger conductor sections make the use of round wire uneconomical from the space factor aspect and in the smaller type of power distribution transformer where similar considerations apply. Furthermore the market calls for a great assortment of strip sizes. Repetitive business on a large scale has not proved to be freely available in the U. K. market and this factor has undoubtedly had an adverse effect on the economy of the process.

* * *

....It follows therefore that any avenue likely to provide long length running on a specific size of rectangular conductor had to be actively pursued.

* * *

The expiry in 1958 of the patents relative to the manufacture and application of continuously transposed conductors offered such an opportunity. (2)

* * *

Continuously transposed conductors incorporate a number of individual strips which have been enamelled with a polyvinyl acetal enamel having excellent physical characteristics. The strips are preferably of an odd number to facilitate the transposing operation and they are mounted in two stacks side by side. The transposed conductors are subsequently paper covered to a thickness commonly ranging from .020″ to .050″.

* * *

As specialists in the manufacture of winding wires we found it necessary to undertake a survey in conjunction with the leading transformer designers, to determine whether interest in continuously transposed conductors was sufficient to warrant the change in design and manufacturing technique necessary for them to utilise continuously transposed conductors in place of the conventional paper lapped rectangular conductors which had been employed for many years.

* * *

The survey revealed a very marked interest in the U. K., continuously transposed conductors being considered particularly suitable for use in transformers of 10 M.V.A. and larger for the following reasons:—

a) **Improved space factor within a winding, individual conductors being coated with 4 mils of enamel only in place of 30 mils of paper.**

b) **Reduced volume of a winding leads to reduced size of core tank and volume of oil required.**

c) **Winding time reduced; for example, a winder handles up to 10 continuously transposed conductors as against 100 individual paper lapped strands. The number of individual transpositions required is therefore limited to a maximum of 9 as against 99 by more conventional procedure.**

d) **Shorter winding time leads to reduced cost and also to shorter delivery times.**

e) **Reduced eddy and stray losses within the winding, leading to lower copper losses.**

f) **Where transport weight is limited, continuously transposed conductors enables either more M.V.A. to be transported for a given weight or reduced transport weight for a given M.V.A.'s worth or transformer. While the conductor was developed initially for use in high eddy-loss, high voltage, layer type windings, it is equally effective in heavy current L.V. windings where very large cross sectional areas are required.**

g) **Where extra mechanical strength is required, copper cadmium strips can be made up into continuously transposed conductors.**

h) **The wide range of continuously transposed conductors available**

makes them flexible in application to a wide variety of sizes and types of high and low voltage windings with heavy or light current.

* * *

From the winding wire manufacturer's point of view the reactions of the transformer designers were indeed favourable. It was firmly established that a demand for the product would be forthcoming provided the cable could be manufactured satisfactorily and economically. Individual windings would require up to three tons of conductor and this would be called for in one size of conductor thus providing the long length operational runs which had not been previously available in relation to the rectangular strip enamelling plant. On the other hand the requirements laid down by the transformer design engineers were exacting from the winding wire maker's point of view. Single lengths of continuously transposed conductor varying between 1200 and 2800 yards, according to the size of conductor chosen, would be required to be contact-free between any pair of strips and throughout the entire length of the transposed cable. The transformer designers considered that unless this could be achieved, danger of circulating currents within the winding could not be avoided.

* * *

Furthermore, the variety of sizes and number of strips making up a transposed conductor likely to be called for by the transformer industry as a whole were large in number and specialised consideration had to be given to this aspect in the design of a suitable transposing unit.

* * *

It was clear that the transformer industry, while admitting the technical and labour saving advantages to be gained in employing continuously transposed conductors, could not pay prices for the conductor which did not result in an overall reduction in cost. Since each individual conductor had of necessity to be enamelled prior to transposition it was quite obvious that the economic limits in this respect would be extremely tight.

* * *

One further point which merited considerable thought prior to undertaking the project was the possibility of a high scrap content during the transposing operation. The transformer design engineers had made it clear that having called for a specific length of transposed conductor, they would expect to receive the length continuously transposed and free from solid joints. If this object were to be achieved, then a transposing head of a very high standard had to be designed.

* * *

Having given careful consideration to the advantages to be gained in manufacturing this highly specialised product and to the exacting requirements of the transformer industry, a decision was taken by my Company in 1958 to proceed with the design of a transposing unit capable of producing continuously transposed conductors of the highest quality and in accordance with the requirements of the transformer design engineers.

* * *

By the end of the year the plant had been designed, manufactured and production techniques established to continuously transpose from 5 - 27 strips, the individual strip sizes ranging from .04″ x .16″ to .09″ x .30″ providing a total cross sectional area of transposed conductor from .03 - 0.7 square inches.

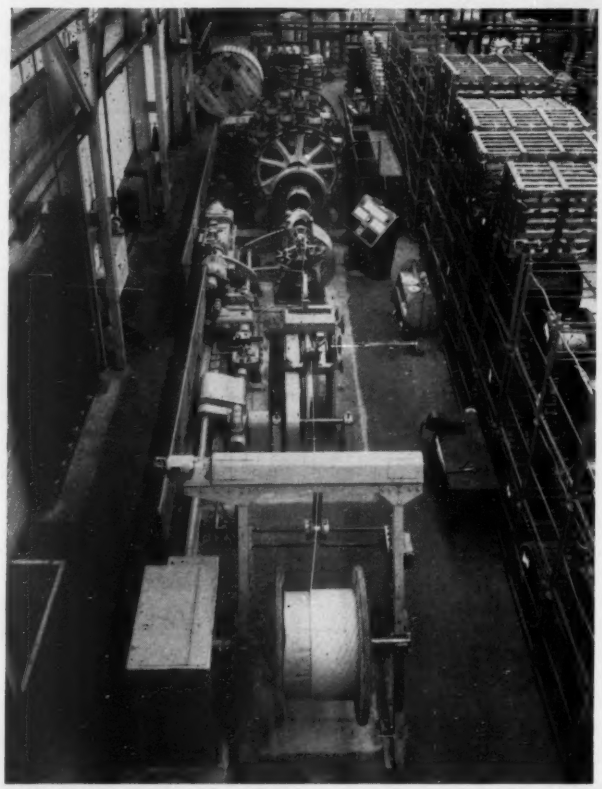
* * *

The initial development effort centred around the design of a transposing head, but known techniques which involved the manufacture of forming tools for each individual transposition were considered impracticable in view of the wide range of transposed conductors likely to be called for by the transformer industry. Effort was therefore concentrated on an adjustable head capable of transposing from 5-27 strips in a conductor range of .04″ x .16″ to .09″ x .30″. An adjustable transposing head incorporating a system of cam-operated fingers was successfully developed and subsequently patented by my Company. (3)

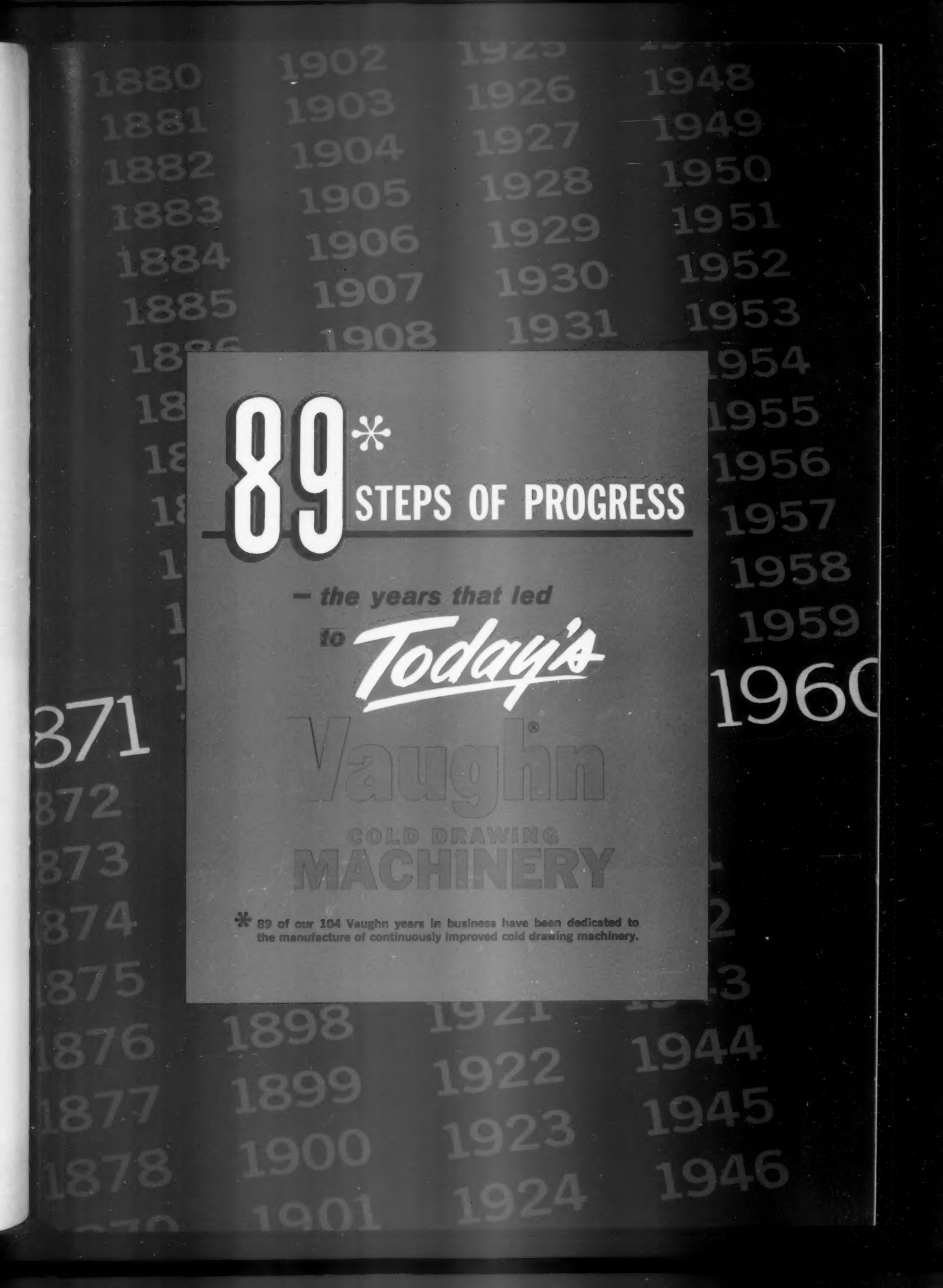
* * *

The transposing head incorporates a system of cam-operated fingers. As they are fed into the head, the strips are arranged in

(*Please turn to page* 1440)



General View of Transposing Plant. * * * * * * * *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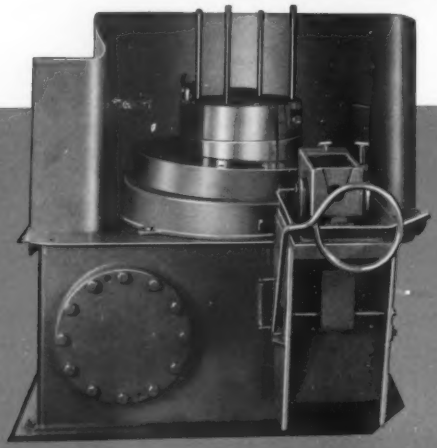

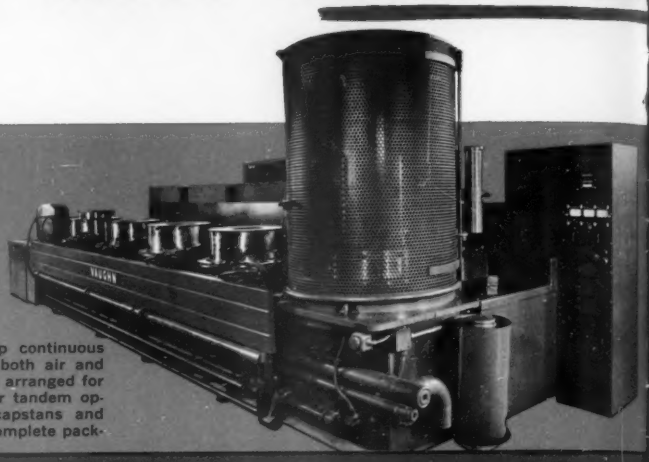

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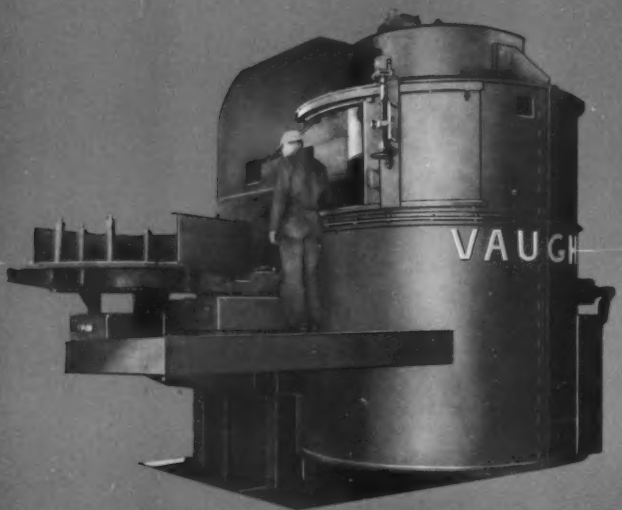

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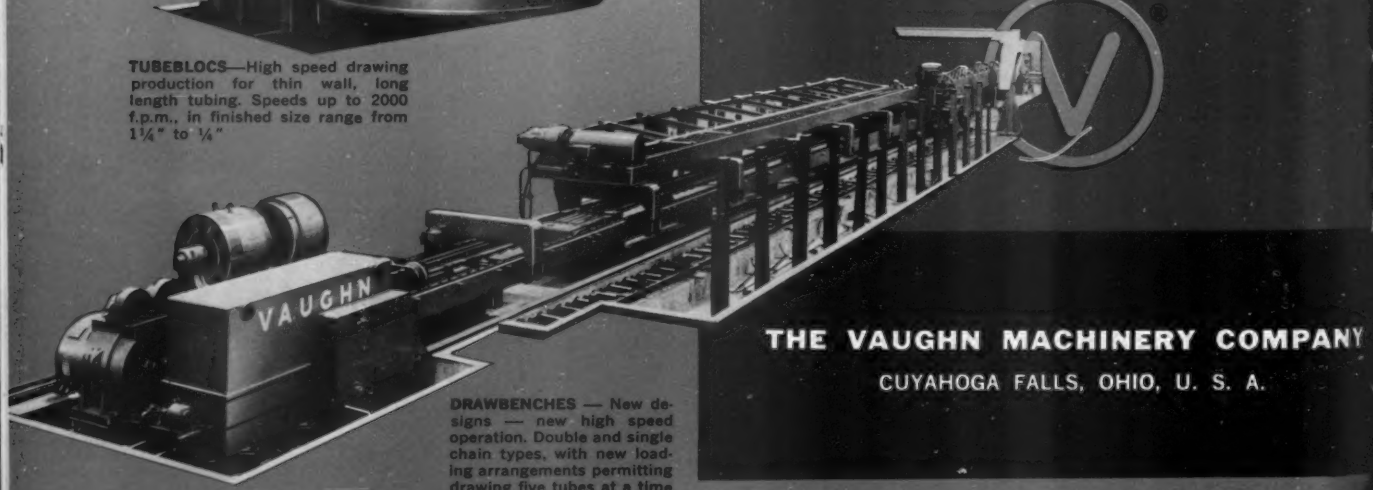

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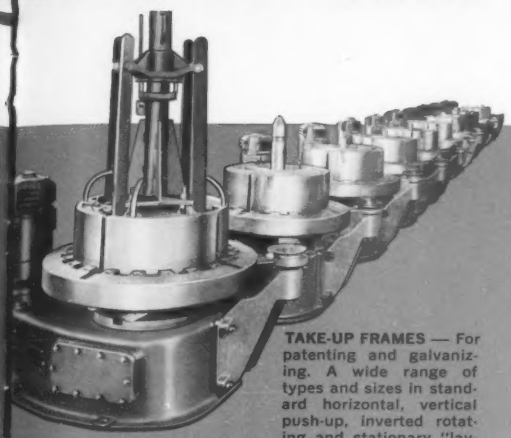

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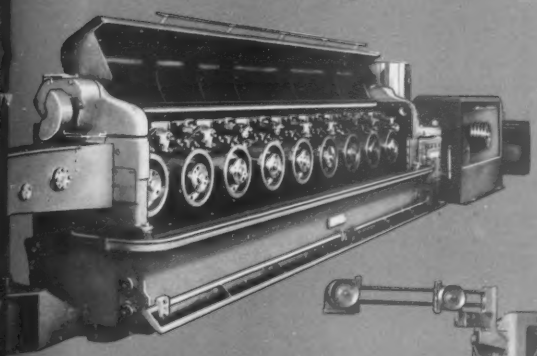

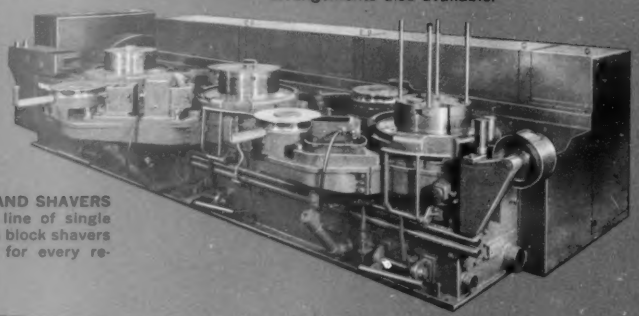

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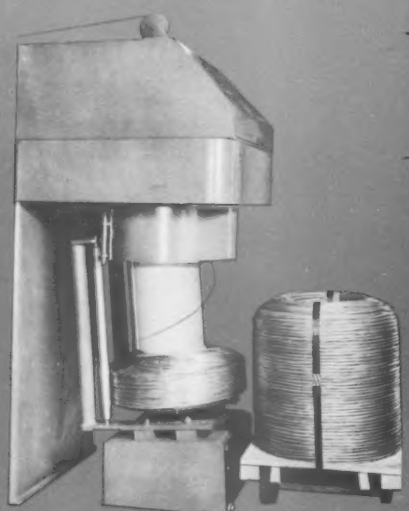

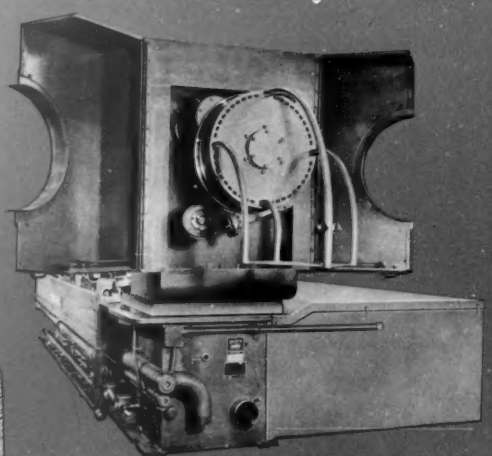

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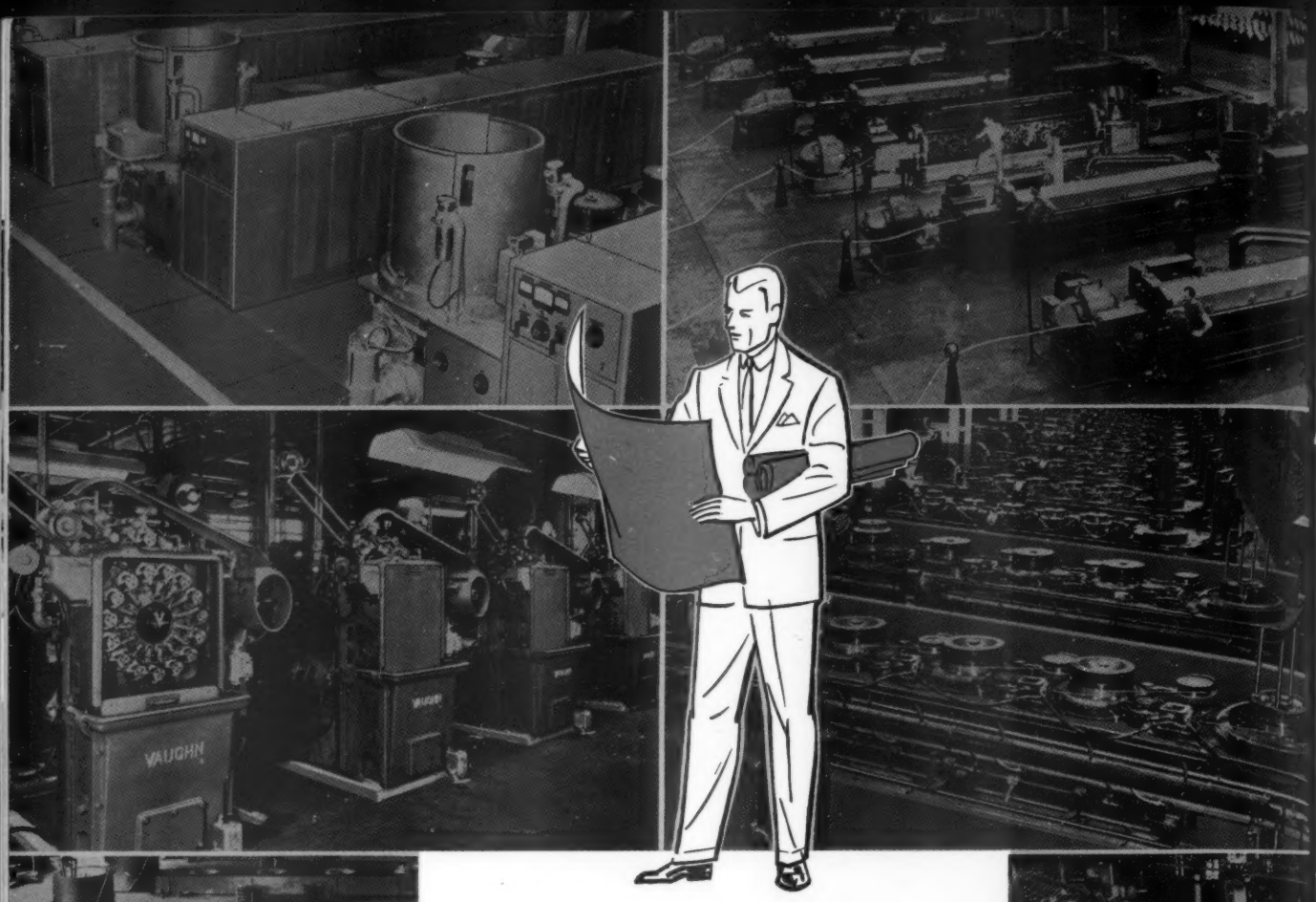

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Cold Extrusion: A Market for Rod and Wire

by Ross W. Perry, Manager
Cold Forming Division
Parker Rust Proof Company
Detroit, Michigan

The rod and wire industry, without question, is always looking for new markets and, although many of you may not be completely aware of this, just such a market for your product is being established — the use of rod and wire for forming into slugs, which are then annealed, lubricated and finally cold impact extruded.

* * *

What is this cold impact extrusion on which there has been so much information published in recent years? Extrusion, in a way, is very closely allied to the cold heading industry with which most of you are familiar. In fact, some cold heading jobs are true extrusion in varying degrees. But, in general, we are talking about working the metal a little bit more, or considerably more, depending on the specific job. In other words, a further advancement in the art of cold forming — where a slug of steel, which has been annealed and lubricated, is completely enclosed in a die with only the end accessible to a descending punch. Then the percentage of reduction made in a single blow is considerably greater and the pressures employed are higher, reaching nearly to the limits of the tool steels themselves. Because the percentages of reductions can be as high as 60% to 90% in a single blow in true closed die extrusion, the slugs of steel are annealed and lubricated prior to this severe cold forming in order to obtain tool life that will make production operation practical.

* * *

In order to get a better understanding, let's take a brief look at just one of the many cold impact extrusion jobs that has been running in production for some time — an automotive wrist pin (Figure 1). Formerly, this part was drilled from solid cold rolled bar stock. Now, this part is made by cold extrusion with punches entering the steel slug from both ends at the same time. This double backward extrusion forms the part with a web in the center. Other wrist pin jobs are in production with the work being preformed only on one end and forming a pin without this center web.

Ross W. Perry

The author attended the University of Toledo. After several years spent in the aircraft industry, with the Ford Motor Company, and the Ditzler Color Company, he joined Parker Rust Proof Company as a Technical Field Representative. He has worked in this capacity for the last 18 years on industrial applications involving metal treatments, serving Parker's customers in every section of the United States and Canada. During the Korean crisis he was recalled from the West Coast to assist in the organization and development of a Cold Forming Division. He has worked in this Division for 9 years, the last 5 of which he has been its manager. The Division is concerned with development, tooling, coating and lubrication connected with the cold forming of metals.

This paper was prepared for presentation at the Annual Convention of The Wire Association in Chicago, Ill., on November 15, 1960.

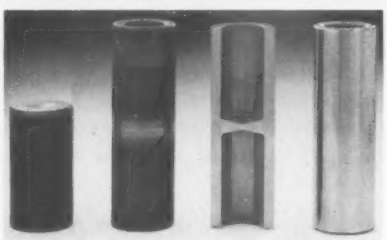


Figure 1

* * *

One facility has reported 40,000,000 wrist pins cold extruded with one of the savings being 5000 tons of steel. A higher quality part is obtained because of the severe cold working of the steel increasing the fatigue life to an average of 51,000 cycles versus 16,000 cycles for the drilled pins.

* * *

There are many other cold extrusion jobs in high production today, such as, automotive universal joint needle bearing cups, stop light switch housings, front end ball suspension housings, truck wheel nuts, door latch gears, brake adjusting clevis pins, roller bearing races, electrical conduit fittings, tractor track pins and many others.

* * *

Why were these jobs converted to cold extrusion? The answer is simple—it's money. When applied to the right part in the right manner, this extrusion results in a very substantial savings of up to 30% to 50% over other methods of manufacture. Actually, in some cases, it is very much more than this, with the finished part being cold extruded for less than the cost of raw materials by the previous process.

* * *

These savings are accomplished through one or all of the following:

1. Cheaper Base Material

It is very often possible to use hot rolled rod or bar stock and eliminate many of the mill extras.

2. Scrap Savings Due To Reduced Amount of Raw Material

This is one of the biggest advantages of cold extrusion, so much so, that cold extrusion is

sometimes referred to as "chipless production". Conventional methods of manufacture employing cup and draw, hot forge and machine or screw machine operations on solid bar can occasion scrap losses of up to 85%, while no material, or virtually none, is scrapped in properly designed cold extrusion.

3. Reduction or Elimination of Machining

Because of the close tolerances and excellent surface finish resulting from the cold work operations, machining can be greatly reduced and sometimes completely eliminated. This results in a savings in capital equipment, reduction in the purchase and maintenance of cutting tools and less down-time for tool changes.

4. Reduced Labor

When the right parts are selected for manufacture by cold extrusion, substantial savings result from high production rates with reduced labor.

5. High Production Rates Per Dollar of Capital Invested

Present cold extrusion production jobs are turning out 40 to 60 parts per minute in a single press, as compared to banks of screw machines or a series of hot forge operations previously required for the same production rate.

6. Greatly Improved Surface Finish

Depending on the extent of the cold work, the surface on the part being extruded approaches that of the extrusion tool finish, and exceeding that of grinding and rough honing so that they sometimes may be eliminated.

7. Closer Tolerances

With the proper press facilities and tool design, cold work tooling will produce parts to closer tolerances and maintain uniform dimension for long periods of operation without interruption as compared to the high maintenance required on other types of production tooling.

8. Improved Physicals

The severe cold working of the metal invariably improves the physical properties of the low carbon steels so that they meet or surpass the requirements previously set for manufacture from alloy steels. Physicals may be developed that will eliminate former specifications for heat treating.

* * *

With such savings possible, industry cannot afford to overlook cold extrusion in connection with their future plans for our highly competitive markets. In fact, at this point, cold extrusion probably offers the greatest potential in the metalworking field and ultimately will take over substantial tonnage from competitive processes. As extrusion grows, it will create an expanding market for rod and wire.

* * *

It is true that some of these extrusion jobs will employ slugs up to 20 lbs. or more in weight, and certainly this would rule out rod and wire as the slug source. However, a great many, probably the majority of the increasing jobs, will be centered around small parts requiring small slugs. In this case, rod and wire will be their main source because it lends itself so well to shearing and squaring, or sizing, shearing and upsetting in one continuous operation to produce low cost, yet high quality slugs in large volume that are so necessary in the cold extrusion field. This slug forming is done on conventional heading equipment or presses adopted for this purpose.

* * *

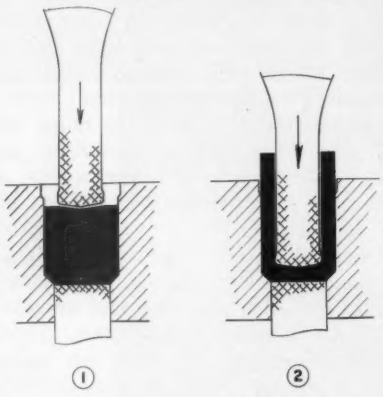
The manufacture of slugs in this manner is not a trouble-free operation and the cold extrusion people will need your help and cooperation. However, most of the problems will be those that you are already largely familiar with and will not be covered here. Instead, let's pass on to some of the conditions and terminology that you will be encountering as you will be working with cold extrusion plants.

* * *

You will find that the percentages of reductions that are being made can be rather startling, and they are usually accomplished in a single blow or hit rather than in a series of smaller reductions. If one blow does not complete the part, usually annealing and relubrication is done before the next sizable reduction is made.

* * *

Backward extrusion, as illustrated here (Figure 2) is a common term. Here, the descending punch enters the slug which is confined in a closed die. The displaced metal is compelled to flow around the punch in a direction counter, or as the extrusion is called "Backward" to the direction of the punch travel. The wall thickness of the cup thus formed is equal to the clearance between the punch bearing area and the die. The bottom thickness is established and maintained by the distance of the punch travel. Usually, these extrusions are not expressed in terms of percentage of reduction, but rather in the ratio of punch diameter to the depth of penetration. If a 1″ diameter punch forms a 3″ deep cavity or hole, it would be referred to as a 1:3 ratio backward extrusion.



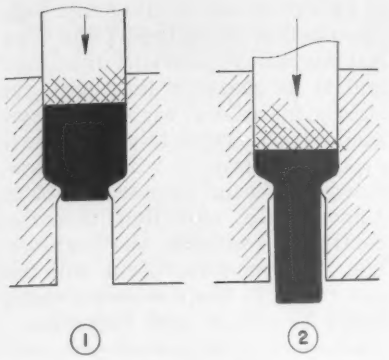
BACKWARD EXTRUSION

Figure 2 * * * * * * * * * * *

Figure 3 illustrates the forward extrusion of a solid. In this instance, the slug is placed in a die with an opening in the bottom. A descending punch confines the metal forcing it by compression to flow through the bottom die opening. As the metal is flowing ahead of the punch and in the same direction, it is referred to as a forward extrusion. The forward extrusion stem is equal in diameter to the bearing diameter of the die.

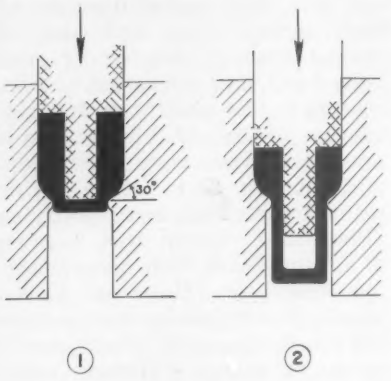
* * *

Figure 4 shows the forward extrusion of a hollow. The same thing is taking place as in the previous slide except that the punch has an extension which establishes the in-



FORWARD EXTRUSION

Figure 3



FORWARD EXTRUSION

Figure 4

side diameter of the hollow stem. The clearance between the punch extension and the die bearing establishes the wall thickness. The hollow slug used for the hollow extrusion is usually obtained by backward extruding a cup. If a hole must be completely through the part, the bottom is pierced out prior to the forward extrusion. Tubing could be used for such a hollow extrusion, but is not generally employed due to its high cost.

* * *

Figure 5 illustrates an ironing type draw — it is not an extrusion, but it is included here as it is often used in place of a forward extrusion. Here, the punch pushing on the bottom of the cup creates a tensile pull — pulling the metal through a die of quite different design and it is ironed onto the punch, producing a cross section of reduction with a corresponding elongation of the part. Cold working by ironing type draw may lack

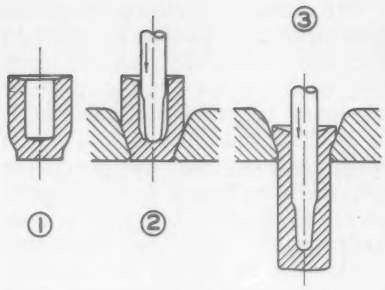


Figure 5

some of the glamour of cold extrusion, but its tooling is far cheaper and the tool life is much superior. Ironing type draw operations generally have fewer problems than forward extrusion.

* * *

You may have noticed from these illustrations that design for cold extrusion tooling incorporates many features, such as the flat nose punch and very wide included die angles, so that it may appear quite different than what is considered conventional tooling. Further investigation on your part will reveal many other new tool techniques. The radius at some points and practically complete lack of radius at other points are very exacting and critical in this type of forming. Time does not permit detailed discussion of tooling as it is a topic in itself. However, it should be realized that tool design and mounting are well based on both extensive research and development, as well as production experience, to withstand the tremendous pressures involved in this field of cold extrusion. It is something with which you should become familiar, and it might be helpful to you with tool problems in even a completely different field. Cold extrusion tooling is designed to control the surface flow of the metal and meter the lubricant during the tremendous elongation of a given surface.

* * *

Lubrication is another extremely important phase of this field of compression forming. The cold impact extrusion of steel is considered by many as the most severe type of cold forming that has ever gone into high production. The pressures that are required and the stretching or increase of a given area of lubrication that is demanded in a single blow are tremendous. Because of this, it is readily appreciated that adequate lubrication was and is a major problem. It must function to provide an uninterrupted film and separating or anti-flux layer between the tools and the work piece at the extreme temperatures generated due to severe metal deformation and at the high unit pressures involved, sometimes exceeding 300,000 psi. The lubrication, therefore, must be virtually integral with the metal surface to avoid migration from under extreme pressure areas and the possibility of metal-to-metal contact under these extreme conditions.

* * *

In this connection, the lubrication provided by treating the steel to produce a phosphate coating, which, in turn, is chemically reacted with a special type of soap has often been credited with making the cold extrusion of steel practical.

* * *

Tests conducted have shown that the phosphate coating and chemically reacted soap film are equal to, or better than, electro-plated deposits of zinc, copper, tin or lead as a separating layer, and yet it does not have the disadvantages of the high cost of application and the removal problems associated with the pure metal coatings.

* * *

Although the term "phosphate coating" is familiar to you, it is not generally realized that there are many types and literally hundreds of variations. Many of these variations are comparatively new and have been adapted to make a far better aid in the cold forming of steel.

* * *

Basically, there are 3 main types of phosphate coatings — iron, manganese and zinc. A zinc phosphate coating is used for cold extrusion and most other types of steel forming because of its outstanding lubricant carrying characteristics. Iron and manganese phosphate coatings have been tried and are not as good. Even the term "zinc phosphate coating" is not adequate identification because of the many formulations available.

All these variations produce a zinc phosphate coating, but they differ considerably in the type of crystalline coating they produce — in other words, the particular type of crystals formed, their size, shape, adhesion, density, hardness and the overall weight of coating produced. These factors are controlled by a large variety of additives in varying amounts that are introduced into the zinc phosphate chemical formulation. The main additives are oxidizing agents, such as nitrates, nitrites, chlorates and combinations of these with metal accelerators, such as copper, nickel and calcium. The chemistry of formulating phosphate coating solutions and forming phosphate coatings is very complex and is not practical for a discussion here. Certainly though, because of the complexity of this coating field and the many formulations that are commercially available for a wide variety of purposes, it is advisable to seek the recommendations and counsel of the supplier of these chemicals for any particular type of application.

* * *

The zinc phosphate coating in itself is not suitable for cold forming, but must be combined with a lubricating agent. This coating acting as a carrier will generally enhance the lubricating properties of most any lubricating media, such as oils, greases, tallows and soaps. However, for cold extrusion work, we are talking about a specific lubricant combination. This combination undoubtedly represents the biggest advance that has been made in the lubricating field for some time. It is provided from a very dilute soap and water solution that is buffered and accelerated to produce a chemically controlled reaction with the zinc phosphate coating itself. This chemical reaction, in turn, forms a water insoluble metal soap — zinc stearate. The reaction converts about 10 to 30% of the zinc phosphate coating into this metal soap. Upon removal of the work from the water soluble lubricant bath, the water insoluble film that has been formed quickly air dries, developing a white appearance becoming slippery and wax-like to the touch.

The entire lubricant combination, the zinc phosphate coating and the chemically reacted soap film becomes an integral part of the metal itself. In other words, it is in chemical cohesion with the metal rather than being simply physically adherent to it. Because of its water insolubility, it is non-hydroscopic, and the lubricated work may be stored for long periods of time without loss of effectiveness, before being introduced into the die for the actual extrusion operation. During the deformation of the steel, the lubricant combination is ironed by the tools, but being a part of the metal surface, it flows with the metal, thinning correspondingly with the increase in surface area to maintain an uninterrupted film. After the cold extrusion operation, the coating is found to be transformed into a smooth, grey, glossy, glass-like layer.

* * *

It may be of interest to some of you that a variation of this same zinc phosphate coating is gaining substantially in use for conventional cold heading operations, such as bolt manufacture, etc. As the phosphate coating manufacturers gain additional experience in the cold heading field, it is believed that these coatings will eventually become quite standard, particularly on the ever-increasing difficult jobs that are steadily being put into production on cold heading equipment.

* * *

A zinc phosphate coating has been developed to produce coatings for sizing and cold heading in conjunction with the so-called strand method of operation. Here the coils of rod are butt-welded to form a continuous strand, which is then passed through shot blasting for mechanical descaling, the zinc phosphate coating installation and sizing die. It is then recoiled and ready for cold heading. This method converts rod to sized wire lubricated ready for cold heading in one continuous operation. Because of the high speeds that are necessary to make strand lines practical, a phosphate coating was developed to produce a coating in as little as 10 seconds. This method of operation and coating has been discussed in detail before the Wire Association at previous meetings, and it is pleasing to report the steady increasing use of this system which completely eliminates pickling operation with its ever-increasing acid disposal problem. Undoubtedly, now that this fast coating is available, the high carbon wire manufacturers will find use for it in their ever-increasing trend to strand type operation.

* * *

A zinc phosphate coating has been in wide use for a number of years in Europe for both the dry and wet high speed drawing of high carbon wire, and also of shaped wire. A number of wire mills have now converted to this coating in this country, to take advantage of the added lubrication it provides for this same type of application. In turn, some spring manufacturers are now specifying "Phosphate" drawn wire because of advantages in their manufacturing operations. However, if you should be considering such a coating for this purpose, please bear in mind the earlier statement about the complexity of phosphate coatings; because the type used for cold extrusion is not generally recommended for high speed, high carbon wire drawing. Consulting with the manufacture of phosphate coatings is very much in order before attempting any trials for test and evaluation in connection with this field.

* * *

Getting back to cold impact extrusion, it is hoped that you will appreciate that time has only permitted highlighting this extremely interesting field. The main purpose has been to bring more fully to your attention that cold extrusion has established itself and is now using substantial steel tonnage. A considerable portion of this tonnage is in the form of rod and wire for making small slugs. Increasing use will be made of rod and wire for slugs as cold extrusion expands and you will want to follow this growth as it develops this new market.

JOIN THE WIRE ASSOCIATION
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Stationary Block Drawing and Handling of Wire

by Richard K. Weyant, President
Enterprise Wire Company
Blue Island, Illinois
and
Wire Engineering Associates, Inc.
South Holland, Illinois

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 15, 1960, at Chicago, Illinois.

The rising cost of labor and equipment and the highly competitive market on many wire items, have forced the management of our wire mills to search for methods to produce and handle wire which more efficiently utilize the equipment and man time to operate the machines. Wire users have also become aware of the savings realized by use of larger packages, many of which are custom made for the job.

* * *

Currently, one of the most popular devices to accomplish this type of package is drawing on a stationary block, popularly called a dead-block. This device allows the packaging of a continuous coil or strand of wire of much larger size than possible on a rotating block. (Figure 1 — Dead Block operating on continuous Coarse Wire machine). It also facilitates the removal of this package without interruption to the drawing equipment. The package so produced may be utilized without removal or additional handling such as tying, loading reels, etc. The operating economies of this method are readily apparent.

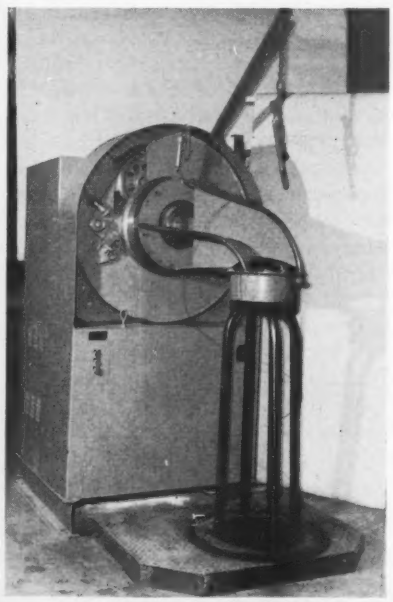

Figure 1. — Dead Block operating on continuous coarse wire machine. * * * *

* * *

Perhaps the best description of a dead block is simply that the wire coil is stationary compared to the conventional rotating coil drawn by a rotating block. The dead block method reverses the conventional procedure and wraps the wire around a stationary block, similar to the stationary spool type fishing reel. The dead block system permits constant operation and continuously feeds non-rotating wire coils vertically or horizontally along guide bars and results in several cost cutting operations over the conventional rotating wire drawing method.

* * *

The stationary wire coil method permits unlimited package size. The wire may be guided by bars, vertically or horizontally and fed directly to spindles or payoff packs in one continuous coil. This system also permits complete inspection of wire coating and measuring wire size without interrupting the production process. Visual checks and sampling of wire coils allows the operator or inspector to check circle size and dead lay when he removes a completed pack or spindle. The spindle or pack can also be removed without interrupting the production process.

* * *

The advantages listed indicate a complete change in conventional wire drawing methods and call for the application of proper Industrial Engineering practice.

* * *

The equipment used for this operation has many variations. Blocking may be accomplished in either the horizontal or vertical plane. The device may be used to draw an additional draft or solely as a laying and packaging device without drawing. Machines have been constructed with stationary block finishing as an integral part of the machine, and powered from the same motor. (Figure 2 — Dead Block Fine Wire Machine). Others have been made as an attachment for standard machines now in operation, and powered from the machine's motor. Still others, for heavier work contain their own power source.

* * *

Mechanically, two main types are in use, one a free floating block, and the other held stationary by a planetary gear arrangement or similar device. The free floating block being more economical to build, requires a method of preventing rotation of the block during operation, as considerable torque is transmitted to the block by the spinner as wire is wound on the block. This is accomplished by a connection to the receiving stem while filling the stem, and a mechanical device during removal and replacement of the stem. The planetary arrangement eliminates the requirement for holding the block. Other devices are in use which transfer the wire to a second block before depositing on the receiving stem.

* * *

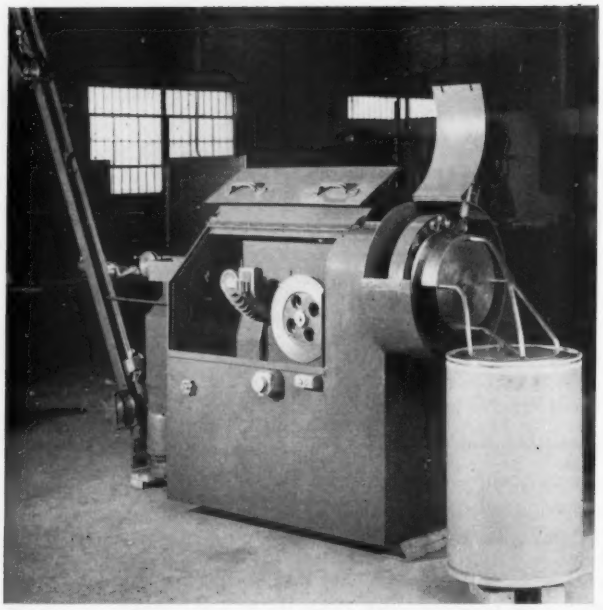

Figure 2. — Fine Wire Dead Block machine. * * * * *

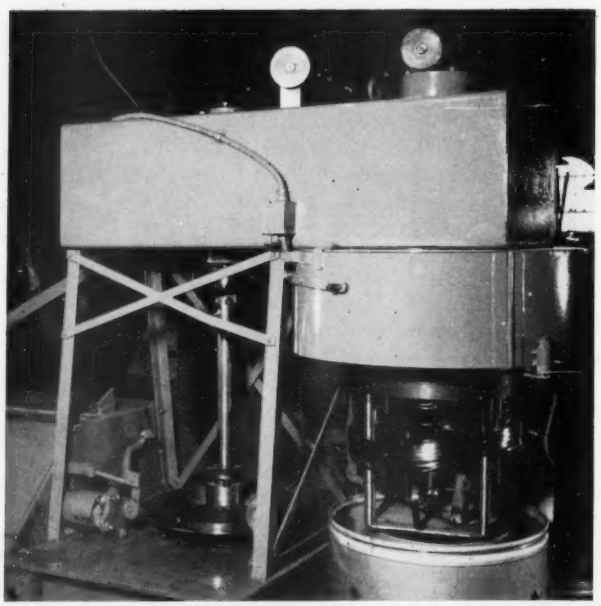

Figure 3. — Dead Block attachment for fine wire machine. * * *

Attached to the stationary block are pins on which the wire is accumulated and transferred to the receiving stem. Many variations of pins are in use to fit the various packages and types of wire. Accumulation of wire on the pins by mechanical means, allows a more compact and heavier package on the stem. This is accomplished by depositing a large number of strands on the stem at one time, rather than allowing each convolution to drop independently. The use of an accumulator often causes a loop of wire on the stem to protrude when a large number of strands are dropped together. (Figure 3 — Dead Block Attachment for Fine Wire Drawing Machines). Means are employed to minimize this condition, which may be very objectionable when packaging fine wire. Accumulators provide opportunity to inspect the wire as it is being drawn, this being very important when producing specialty wire.

* * *

The control of cast and lay are controlled on the spinner. When a draft is accomplished on the stationary block, an adjustable die holder will usually suffice. When the block is used only for packaging where no draft is taken, the cast and lay device must be accurately made and completely adjustable, such cast and lay mechanisms are limited to a definite range of sizes if satisfactory products are to be produced.

* * *

The economies of this method of handling is of prime importance. Economies are greatest in the intra-plant usage of these packages. (Figure 4 — Group of dead block units on a set of Fine Wire Machines). Customer economies have great appeal. Block stripping time with its accompanying machine downtime are eliminated. Actual inspection while drawing minimizes reject material at its source. Bundling and tying of wire coils is eliminated. Stems of wire are easily palletized which eases handling and decreases storage space. The elimination of rotating reels on subsequent operations and reel loading time. The items listed are an important part of the work load on processing equipment and proper study and application of this type of handling can increase productivity per man as much as 100%. Emphasis must be placed on

(*Please turn to page* 1432)

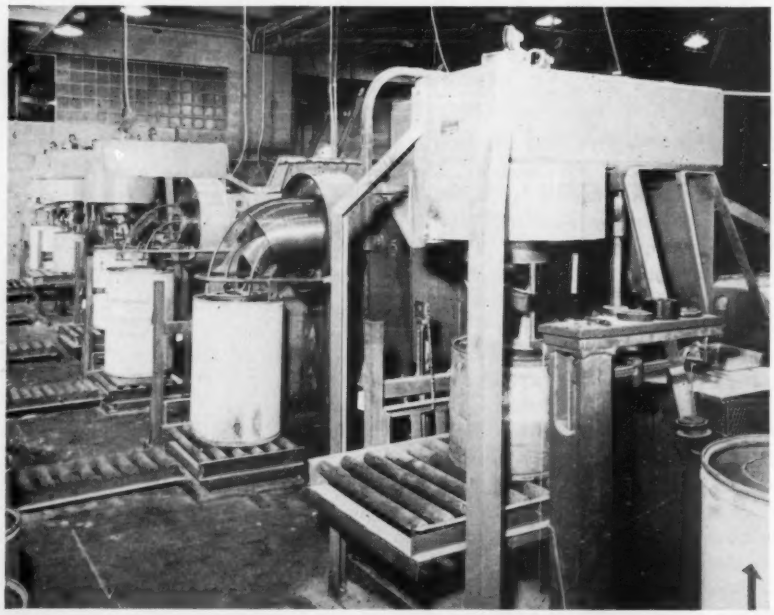

Figure 4. — Group of Dead Block units on a set of fine wire machines. * * *

Color Applications in the Wire and Cable Industry

by Sumner H. Levin
Technical Director
The Blane Corporation
Canton, Massachusetts

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 15, 1960, at Chicago, Illinois.

The author received a B.S. in Chemistry degree from Clark University in 1942. He was with the U. S. Air Force from 1942 to 1946 and in 1946 joined the Technical staff of Plymouth Rubber Co. Rejoining the Air Force in 1950, he spent three years there, again entering Plymouth Rubber's employ in 1953. In 1958 he was engaged by the Blane Corporation in his present capacity.

The expansive growth of the Wire and Cable Industry has caused color to play an ever increasing role in this upsurge. Color has a multi-varied role in the manufacture of wire and cable. It was as we all know primarily used for identification purposes, but with the steady growth of various modern appliances in a wide range of colors on the market today, it has become essential that the wire be custom colored to match the attaching appliance.

* * *

Once it was established that color was an integral part of wire and cable, it became necessary to determine the best way to present it to the wire manufacturer. Obviously raw pigment would not be best for several reasons, one of the major ones being excessive factory contamination. We at Blane recorgnized that a pellet of the same dimensions as an electrical compound pellet would when tumbled with the compound give even color dispersion and at the same time eliminate equipment and factory color contamination with this dust free concentrate. By the same line of reasoning it was determined that a fine grind of this concentrate would do the same job for dry blend extrusion operations.

* * *

The choice of ingredients in making color concentrates had to be carefully studied because we realized that this color would be going into wire and cable with specific aging and electrical standards. Of course it was essential to do extensive lab work on raw materials such as pigments, resins, stabilizers, etc., and finally select those with the best balance of properties to fulfill essential requirements. This was accomplished by running comparative aging and electrical tests on the selected base and the selected base plus the pigment. After the proper pigments had been selected and concentrates were made up, a new testing program was inaugurated by running aging and electrical tests on Blane Electrical Compounds in their natural state alongside of these same compounds colored with the various selected concentrates. From that point, the logical sequence in our development program was to set up a standard series of color concentrates in NEMA (National Electrical Manufacturers Association) colors, and also to be geared to manufacture custom color concentrates.

* * *

It then became necessary to duplicate under actual production conditions what had been accomplished in the Laboratory. The actual factory production of these concentrates had to be set up and handled in a section of the factory that was completely removed from all other production facilities. A separate blending and milling operation was set up to manufacture these concentrates.

* * *

At first it was difficult to reproduce in the factory exactly and much experimentation had to be done to develop (1) the proper sequence of addition of ingredients to the Blender (2) Correct Blender temperature (3) the ideal blending cycle to obtain the truest possible color value (4) Correct mill roll temperatures so that the stock itself would not stick or fall loosely from the mill rolls (5) The length of the milling cycle (6) the proper size strip and correct number of passes through the water trough before entering the pelletizer were also determined to obtain an eye appealing and marketable pellet.

* * *

Let us examine briefly the advantages that color concentrates in pellet form offer to the Wire and Cable Industry. To begin with the customer has a uniform size pellet to tumble with his compound pellets and will be able to obtain even color dispersion. His factory color contamination will be nil as these pellets provide a dust free concentrate. He will get rapid and full dispersion in extrusion from these concentrates with a maximum color yield per pound. These concentrates have a low specific gravity, are non-migratory, acid alkali resistant, and have excellent heat stability and light fastness. However, the main advantage, and I cannot stress this too strongly, is the inventory situation for the wire and cable manufacturer. By stocking small amounts of these concentrates he can buy most of his compound in a natural base and make any color he has to, rather than being forced to buy a variety of colored compounds, thereby saving valuable inventory costs and space.

* * *

So much for the standard NEMA colors. Another phase of color that is rapidly developing is the custom color concentrate, whereby the wire manufacturer who requires a

how TEAMWORK PIONEERED the use of COLOR in PLASTIC JACKET CABLES

Lenz Electric Manufacturing Co. felt the need in the electronics industry for color in plastic jacketed cables.

In pioneering its development and use, Lenz Engineers called upon the Blane Corporation for a vinyl insulation material in various colors that would offer faster, easier, and permanent identification of cables before, during, and after installation.

Lenz specified that the material must facilitate connections between electronic units, make cables easier to locate and end forever confining cable jacket colors to the few dull and nondescript shades.

The result is Blane's custom colored jacketing compounds.

We salute Lenz for its initiative in this important program of raising the industry's standards by producing quality, practical and economical colored plastic jacketed cable.

Blane is proud of the part it has played in helping to introduce color for plastic cable applications.

THE BLANE CORPORATION
CANTON, MASSACHUSETTS

BLANE

specific color for a specific job can submit a sample showing the color and the type of compound required for the job. This color can then be matched in the desired base selected by the customer. After the match is made, a calculation is affected as follows to determine the exact structure of the concentrate, that is 1 to 100 or more as will be shown in the following tables.

TABLE NO. 1

Example #1	*Final Weighing of the Color Match*
Required Base	100 parts (Grams)
White Pigment	.25 parts (Grams)
Yellow Pigment	.11 parts (Grams)
Orange Pigment	.11 parts (Grams)
Black Pigment	.03 parts (Grams)

TABLE NO. 2

Concentrate Conversion	
White Pigment	.25 parts (Grams)
Yellow Pigment	.11 parts (Grams)
Orange Pigment	.11 parts (Grams)
Black Pigment	.03 parts (Grams)
Total Pigment	.50 parts (Grams)
Total Base	.50 parts (Grams)
	1.00 parts (Grams)

Concentrate is 1 part/100 parts of base.

TABLE NO. 3

Example #2	*Final Weighing of the Color Match*
Base	100 parts (Grams)
White Pigment	.20 parts (Grams)
Yellow Pigment	.20 parts (Grams)
Orange Pigment	.20 parts (Grams)
Black Pigment	.15 parts (Grams)

TABLE NO. 4

Concentrate Conversion	
White Pigment	.29 parts (Grams)
Yellow Pigment	.20 parts (Grams)
Orange Pigment	.20 parts (Grams)
Black Pigment	.15 parts (Grams)
Total Pigment	.84 parts (Grams)
Total Base	.84 parts (Grams)
	1.68 parts (Grams)

Concentration is 1.68 parts/100 parts of base of a 50/50 color concentrate.

* * *

Actually there is no hard and fast rule which determines the optimum concentration of pigment in a concentrate, but in as much as this is custom work, the customer's extrusion equipment is taken into consideration. For example, with a 20:1 ratio extruder, a concentration of 1% will give a full dispersion free of color streaks. Other people who might be operating with 15:1 or even 12:1 equipment require a weaker concentrate whereby he can use more volume to obtain the desired results.

* * *

These concentrates are made weaker merely by increasing the amount of base and keeping the amount of pigment constant.

* * *

The use of the color concentrate in Polyethylene insulation materials offers the same advantages as in vinyl insulation plus several other features which are due to the basic nature of polyethylene. We all know that polyethylene is transparent by nature, therefore a much weaker color concentrate can be used. The usual strength of a polyethylene color concentrate is in a range of from 15% to 25% pigment and the rest in polyethylene base. A concentrate of this strength is used to color polyethylene at a ratio of 1 part concentrate to 100 parts of base. Due to the absence of filler and lead stabilizers in polyethylene a truer color value is obtained than with vinyl. Electrically approved pigments such as Monastral Reds and Blues, Pthalocyanine Greens, Chrome Yellows, Molybedate Orange, and Mapico Reds are the types used for these concentrates with the polyethylene base of an electrical grade.

* * *

Polyethylene color concentrates can be processed in several ways, for example: The polyethylene base pellets can be blended in a regular type blender with the pigment and a small amount of mineral oil to facilitate the adherence of the pigment to the pellet, that is,

Polyethylene Base Pellet	75 pounds
Pigment	25 pounds
Mineral Oil	100 CC

* * *

After the blending cycle is completed the material can be bamburied and milled on two roll mills, stripped off and ground. Another possible method is milling and passing through a long barrelled extruder to obtain full dispersion plus the added advantage uniform pellets will have over a granular color concentrate. Either of these two methods have proven to be very satisfactory in actual production and it is merely the availability of equipment which can decide for the manufacturer which choice to follow. In situations where there are not any blenders available for preblending polyethylene pellets and pigments, a rather crude but effective system can be devised by using a cement mixer type device or even a sealed barrel that can be rolled on the floor to simulate the action of a blender. When this blend is made a sample of it is taken to the laboratory and checked in the following manner.

* * *

The concentrate is milled up into a well dispersed mass and then one part of this concentrate is let down in one hundred parts of polyethylene pellets, it is then polished in a press and checked against the standard for dispersion of pigment and shade, then the concentrate is processed in the factory and the finished product is rechecked again in the laboratory for color dispersion and shade.

* * *

So much for the technical aspects of the basic manufacture of color concentrates. Now let us consider what colored vinyl and polyethylene electrical insulation can offer to the wire and cable industry. There is a faster, easier and permanent identification of cables and wires before, during and after installation, it speeds up connections between electronic units and makes for easier location of cables. In retrospect we find that color applications in wire and cable has gone from a few nondescript colors for minor uses to a many hued variety for major applications in appliances such as Electric Shavers, Clocks, Radios, Vacuum Cleaners, etc. In a comparatively short period of time, the future should see an ever increasing demanding use of color in the wire and cable industry.

Have you considered joining
THE WIRE ASSOCIATIONS?
Write for booklet and an application for membership.
453 Main Street
Stamford, Conn.

The Diamond Mine In Your Die Room

by Jack Wiziarde
Diamond Product Sales Manager
Abrasives Division
Elgin National Watch Company
Elgin, Illinois

When the cost of material **and** the cost of the time required to use it are both considered, the wire industry will spend from 8 to 10 million dollars on loose diamond abrasives this year. It's a surprising figure, but a true indication of the economic importance of the diamond in wire drawing.

* * *

Even more surprising, approximately 25 per cent of this total can be saved! This is the "diamond mine in your die room."

* * *

Fortunately, it's an easy mine to work. No special systems or drastic changes in procedures are required. There is no need to upset a smooth running and highly essential operation, as is the case with most die rooms. Rather, to realize the important savings that are possible requires only that the basic facts of diamond abrasive application, as proved in actual production situations, be recognized.

* * *

These "facts of diamond application" involve (1) what you use, (2) how you use it and (3) how much of what you use you get back.

What You Use

In considering **what** loose diamond abrasive you use, purity and accuracy of particle size grading are the important factors. Variations in the diamond itself from source to source make little difference in finishing efficiency.

* * *

Even the new man-made diamonds show up quite well under certain conditions in controlled lapping tests. Fundamentally, diamond is diamond. When you use it, differences in technique alone will have a far greater effect on results than will slight differences in the physical characteristics of various types of diamond.

* * *

Purity and grading accuracy, however, are vital. For instance, if diamond abrasive is adulterated, the loss in finishing efficiency (actually the increase in both finishing time and amount of diamond required to produce desired results) will be in direct proportion to the percentage of impurities present.

* * *

Improper grading has the same effect. Even if the danger of scratches produced by oversized particles is ignored, the excess of "fines" normally present in carelessly graded diamond abrasives actually constitutes a percentage of adulteration. "Fines" is the term applied to particles smaller than the minimum micron size established for a given grade of abrasive by the Bureau of Standards.

* * *

These undersize particles do no cutting and, even though they make up a portion of the carat weight of diamond present, they might as well be talc or miller's flour.

* * *

Considering their prime importance, making certain of the purity and grading accuracy of the diamond you use is a relatively simple matter. The easiest way to make sure, of course, is procurement from a reliable source with certification of grading in accordance with Bureau of Standards specifications. But even when casual purchases are made, examination with a polarizing microscope will quickly reveal any irregularities. Such inspection service is readily available.

How You Use It

Given pure and accurately graded diamond abrasive to begin with, how it is used is the next important consideration. Here, once again, the really important factors are more basic than the common debate over the use of diamond abrasive in compound form versus loose or dry powder. Concentration or relative density of diamond in the material actually applied to the working surface is what counts most.

* * *

Careful lapping tests performed under laboratory conditions, backed up by countless actual production records, have proved that

Jack Wiziarde

The author joined the Elgin National Watch Company in 1950 and initially was assigned to the Ordnance Engineering Staff. He progressed through various watch division departments and at the time of his transfer into the Abrasives Division, was foreman in the Ordnance Sub-Assembly Department of the watch division.

In the Abrasives Division he was assigned to the Ohio territory as an Abrasives Field Engineer and was then promoted to District Sales Manager for Ohio, Pennsylvania, New York, the Carolinas and Virginias.

In his present capacity, he is responsible for all phases of marketing of all diamond products of the Company in the United States and foreign markets.

This paper was prepared for presentation at the Annual Convention of The Wire Association in Chicago on November 15, 1960.

too much diamond in the working mix is not only wasteful but also impedes cutting action. On the other hand, too little diamond has the effect of robbing the abrasive material of its cutting efficiency and increases the time required to produce a finish tremendously.

* * *

Optimum concentrations for maximum cutting efficiency have been experimentally determined for almost all types of applications and are available in pre-mixed or compound form. When dry powder is preferred, proper concentrations of diamond in the working mix depend on the individual operator's skill. Maintaining these proper concentrations is one of the intangibles that makes die finishing an art.

* * *

But regardless of whether compound or dry powder is used, concentration is the important consideration in cutting efficiency. Carelessness or inattention to this phase of diamond abrasive application is perhaps the most serious single cause of waste of both time and material.

* * *

Another factor that must be discussed in connection with "how you use diamond" involves the selection of grades to achieve a specific finishing result. The problem is not in what grade to finish off with. Here the visible results are usually an obvious indicator of the proper grade.

* * *

Rather, the problem consists of selecting the intermediate grades to be used in progressing from rough to finish. Using too many intermediate grades is the common error.

* * *

For example, an altogether too frequently used sequence of abrasive grades used to finish a drawing die from the rough state is 45, 15, 9, 6 and 3. The same result can be produced in most cases, in less time and with less diamond, using only three grades of abrasive — 45, 15 and 6 or 30, 9 and 3.

* * *

A glance at the particle size ranges corresponding to the various Bureau of Standards grade designations will show why this is the case. Notice that the size range for grade 30 particles overlaps both the grade 45 and the grade 15 ranges. Further, grades 9 and 3 are virtually adjacent in decreasing order of particle sizes while grade 6 simply straddles an area comprising the high and low limits of grades 3 and 9 respectively.

* * *

This does not imply that certain grades are unnecessary. Instead it only serves to illustrate that the grades to be used should be selected to suit the job — and the fewer the better from a cost standpoint.

* * *

Where several grades of diamond abrasive are used in sequence, each will produce a certain degree of finish on a given material in a given time. This time requirement varies only slightly in response to reasonable variations in the condition of the beginning surface. By and large, this means that producing a desired finish in 5 rather than 3 steps will require on the order of one third more time and one third more diamond to produce the same result!

* * *

Given pure and accurately graded diamond to begin with, selecting the proper abrasive grades and maintaining an optimum concentration of diamond in the abrasive mix are essential to maximum finishing efficiency.

How Much You Get Back

Diamond is not completely destroyed as it performs its abrasive function, only changed a little in particle size and shape. Carat for carat, its value remains unchanged and, especially in closely controlled and painstaking die finishing operations, a surprisingly large proportion of all diamond used can be recovered.

* * *

The waste sludge produced in die finishing, frequently discarded, is really the "pay dirt" of the diamond mine in your die room.

* * *

Since the practice of reprocessing used industrial diamond refuse first got its big start during the World War II and Korean wartime shortage of diamond, reclaiming has achieved status as a reliable, practical operation. Further, proper and even advantageous applications for reclaimed diamond have been proved out.

* * *

Incidentally, for the purpose of this discussion, it is not necessary to question the merit of reclaimed diamond abrasive material for wire drawing die finishing or any other specific application. The important point is that diamond **can** be reclaimed and has established value. To ignore this value is literally to throw money away.

* * *

Diamond refuse recovery for reclamation is quite simple in a die finishing operation. The diamond is used carefully in a limited and clean area. Recovery is simply a matter of depositing applicators, swabs and wipers in a clean container and collecting excess sludge or slurry. Conservatively, at least a third of the diamond used can be recovered in terms of reclaim credits.

* * *

That's all there is to it! As is so often the case when really important and practical savings to be made, getting the most out of the "diamond mine in your die room" is a simple matter of attention to basic principles.

* * *

The amounts involved are surprisingly large, too. A potential annual saving of 2 and one half million dollars is not to be tossed lightly aside. Nor are troublesome or untested innovations required. There is no need to interfere with established and successful die room operation.

* * *

All you have to do is be sure of the purity and grading accuracy of the diamond you buy, use as few different grades as practical for your application, make sure of optimum concentration of diamond in the abrasive mix applied and, finally, provide for conservation of diamond refuse. These simple recommendations are based on proved results and have nothing to do with brand preference, natural versus man-made material or individual finishing techniques.

* * *

And if you want a rough idea of

(*Please turn to page* 1433)

Vinyl Plastisol — A Versatile Material for Insulating Wire and Encapsulating Wire Harness Constructions

by Robert C. Lawrence, Jr.
Technical Sales Representative
Chemical Products Corporation
East Providence, Rhode Island

Vinyl resin is known for its excellent electrical properties and physical durability, and with the advent of plastisol formulating it has been possible to take increased advantage of these vital end characteristics.

* * *

In this age of missiles, computers, and transistorized electronic equipment, miniaturization of electrical parts is a necessity and plastisols are playing a vital role in the developments. More than just a new form of vinyl plastic, these plastisol compounds are in themselves a production tool. Supplied as a liquid, plastisols are applied or molded in that state, and — when in place — will convert to a tough, flexible solid on simple exposure to moderate heat. Fabrication problems are simplified. In fact, because plastisol will flow to become an integral part of a product, it actually assists in the final assembly. This simplicity of fabrication coupled with the exceptional versatility possible through formulation explains why plastisols have come so quickly into commercial use by wire and cable manufacturers. Typical of their versatility, these compounds — supplied in an almost lacquer thin viscosity — are die-wiped on extremely fine wire to become its primary insulation, or — supplied as a taffy-like paste — they can be used for flexible encapsulation of wire harnesses. Applied to a stranded wire and cable they can be used as a sealer or filler particularly in water tight cable constructions.

* * *

Plastisols are dispersions of high molecular weight vinyl chloride polymer and/or copolymer resins in liquid plasticizers. They exist as liquid compounds at ordinary room temperatures, but on exposure to moderate temperatures ranging from 300 to 400° F. (depending on formulation) the plasticizers solvate the resin, thus converting the compound to a homogeneous solid. In order to impart specific characteristics to a given formulation, various stabilizers, pigments and other modifiers are added.

Robert C. Lawrence, Jr.

The author joined Chemical Products Corporation in 1957 as a technical sales representative specializing in their Nelco cable coatings and electrical applications for their vinyl plastisols, known as Chem-O-Sol. Previous to this he had seven years experience as a technician in vinyl polymer and other synthetic resins research and development while studying sales and marketing at Harvard, Boston and Brown Universities.

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 15, 1960, in Chicago, Illinois.

* * *

There are many variations in chemical and physical properties to excite the imagination of the designer. Some of these properties are as follows:

***Viscosity*: As required from 1000 cps. to over 1,000,000 cps.**
***Solids Content*: 100% (Sometimes a small portion of volatile viscosity depressant is added. Such compounds are often referred to as "modified plastisols", and when the volatile content exceeds 5% and becomes a dispersing agent, they are known generally as organosols. In converting an organosol to the final solid state, the solvent must be released. Hence they must be applied in relatively thin films, compared to plastisols.)**
***Specific Gravity*: 1.17 to 1.35.**
***Color Choice*: Almost unlimited.**
***Tensile Strength*: From 500 psi to 2700 psi.**
***Percentage Elongation*: 150 to 600.**
***Hardness*: As required from 10 on the Shore A_2 Durometer Scale to 65 on the Shore D Durometer Scale.**
***Heat Resistance*: Will resist temperatures slightly over 200° F. in continuous exposure up to 2000 hours, and will endure intermittent exposures at 450° F. for 2 hours or less.**
***Chemical Resistance*: Outstanding to most acids, alkalies, detergents, oils and some solvents.**
***Flexibility*: As required to temperatures as low as —65° F. Flexibility is correlative more or less with hardness; thus generally, the harder the compound, the less flexible it becomes.**
***Flame Resistance*: Self-extinguishing.**
***Weather Resistance*: A film of plastisol 25 mils thick (or more) will withstand a temperate climate for about three years. Degradation of the film is in the form of some color fading and stiffening.**
***Electrical Properties*:**
Dielectric Strength — Minimum of 400 volts per mil at room temperature when fused in sections 3 mils thick and over. Maximum of 800 volts per mil when fused in sections 10 mils thick.
Volume Resistivity Range at 25°C. 14.5×10^{5} - - - 2.44×10^{16} ohm Cm3

* * *

Generally speaking, the above named properties within the designated limits, are representative of almost any well formulated plastisol. They can be varied in nearly any combination. Though in some cases it may be necessary to sacrifice one property to gain another, most often a reasonable

compromise can be made. For individual end uses, the need for special properties such as extra dry film, absolute non-migration, compatibility with other materials, fast or slow gelling and fusing characteristics, and light and stain resistance frequently arises. These, too, can be controlled through skilled formulation.

* * *

The inventive genius of today's designers and engineers, together with new and improved plastisol formulations, have lead to new techniques for applying plastisol formulations, have led to products. Typical of these is the die-wiping method.

* * *

The process is as simple as coating braided wire with lacquer, yet the results are unique. The necessary equipment includes a reservoir of about two-gallon capacity located directly beneath a bank of steel wiping dies. Inside the reservoir there are small sheaves corresponding in number to the dies and mounted vertically beneath

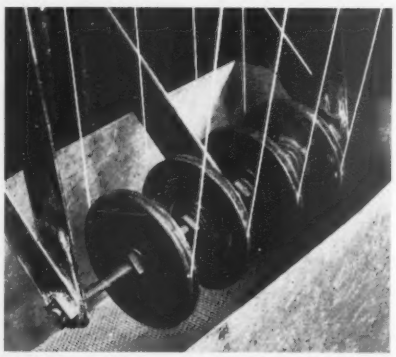

Figure I * * * * * * * * * * *

them. (Fig. I). At the bottom of the tank, leading from an outlet, is a ½" flexible hose terminated by a pump which pulls the plastisol from the reservoir and supplies it to a manifold. In turn, the manifold supplies a number of ¼" copper tubes projecting from it each extending horizontally 6" or 8" to a point just below the place where the wire enters the wiping die, completing the circuit. (Fig. II). The wire enters the full reservoir away from the dies and passes under its assigned sheave picking up liquid plastisol as it moves through the solution and into the first die mounted directly above the sheave. Just before the

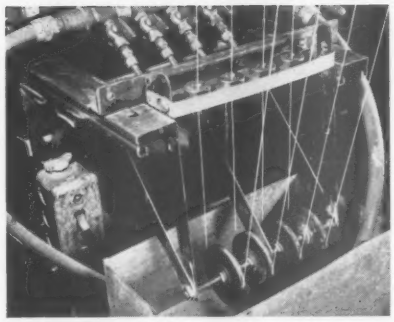

Figure II * * * * * * * * * * *

wire reaches the second die, it passes through the stream of plastisol discharging from the copper tube ensuring complete coverage. (Fig. III). The dies, of course,

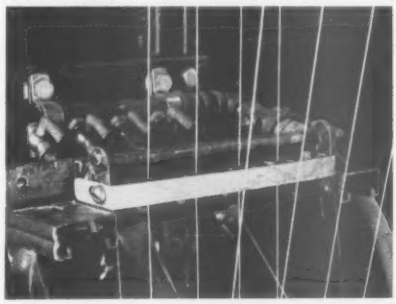

Figure III * * * * * * * * * *

shape the coating, and a completely concentric film on every radius is the result. They are mounted in a position which will allow them to move on a circular plane, thus as the coated wire enters the wiping die it will automatically position itself for an even plastisol coating around the circumference of the wire. (Fig. IV).

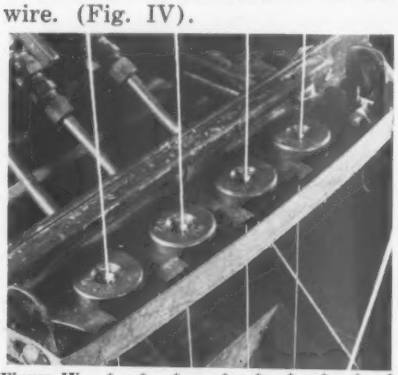

Figure IV * * * * * * * * * *

At this point, the wire is coated with a wet film of plastisol by its two passes through the liquid compound and the plastisol is ready for conversion to a solid by fusion. This is accomplished by feeding the wire into a chamber heated to a temperature of 350 to 400° F. Figure V shows the complete die-wiping system and the wire before it enters the fusing unit. The chamber or fusing unit is sometimes patterned after a conventional lacquer tower, but often an adaptation of a simple stovepipe assembly is satisfactory.

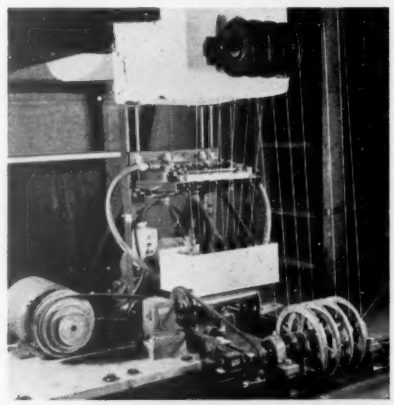

Figure V * * * * * * * * * *

In general, fusing time is the only limit on operating speed, and this is dependent on several factors: the thickness of coating, temperature, length of oven chamber, type of heating, and cooling methods. Essentially, plastisols will fuse or flux instantaneously once their entire mass is raised to a temperature of about 350° F. with the exact temperature depending on formulation. But by nature, plastisols are rather poor conductors of heat, thus increases over the basic fusion rate are usually accomplished through improved heat transfer. Most often this is done by raising the temperature above the minimum 350° F. level, within limits, and increasing the velocity of air circulation, assuming that a forced hot air system is used. For example, it is possible to process a 9 mil diameter wire coated to a total thickness of 13 mils in two passes at the rate of 760 feet per minute when the oven has two 20-foot long sections and the temperature is 400° F. using a forced air convection heating system.

* * *

Depending on the requirements for the total thickness of the primary insulation, this process can be repeated as many times as necessary to build the desired thickness using progressively larger

dies. By this method, the thickness of the insulation can be practically unlimited. It should be mentioned also that the same general procedure can be followed using equipment mounted horizontally if that is more convenient.

* * *

The question might be asked, "Why use plastisol instead of a conventional extrusion compound?" The answer depends on the requirements. To extrude a two or three mil coating of vinyl film onto wire is almost impossible. Using a plastisol and the die wiping process, it is very simply accomplished. Plastisols might not carry as low a raw material cost as less expensive vinyl extrusion compounds, but in cases of special needs for exact uniformity of coating, minimum film thickness, greater flexibility, cold flex, extra heat resistance, variation in hardness, and other unique properties, the slightly higher cost of vinyl plastisol can be more than justified. Then too, these costs can be more than balanced by the lower initial outlay for application equipment.

* * *

Current applications for plastisol coated wire include detonator wire, small wires, and cables used in conjunction with printed circuit boards, small wires used in guided missiles and satellite components as well as in transistorized radios and other miniaturized electronic equipment. There are innumerable possibilities for future applications.

* * *

The need for a heavy duty insulating and protective covering on underground connections, large strain relief assemblies used on missile ground support cables, and waterproof cable splices is obvious, yet for many years prior to the development of vinyl plastisol formulations it was almost impossible to encapsulate large wire assemblies with vinyl plastic because of processing disadvantages. Now with the innovation of plastisols, there is an entirely new concept in the manufacture of wire harness constructions, vinyl strain reliefs, and molded cable splices.

* * *

The free flowing nature of plastisols in the liquid state make them ideally adapted to a wide variety of molding applications. As liquids, these materials dispense easily into molds of intricate and complex shapes, thus eliminating the need for expensive high pressure injection systems. Conversion to the solid is accomplished simply through fusion by means of moderate heat. The fusion process is non-reversible and takes place without the benefit of pressure or catalytic action. With most plastisols 100% solid or nearly so, shrinkage from the mold can be held to an absolute minimum.

* * *

An outstanding feature of plastisols when used in conjunction with extruded vinyl wire and cables is its ability to flow and fuse into extruded vinyl jackets thereby becoming an integral part of the extruded insulation and eliminating the use of primer and adhesives. This happens during the fusing process when the extruded insulation will soften with the heat, thereby producing a "weld" with the plastisol. The same thing can be accomplished using extruded vinyl tubing or vinyl coated glass tubing.

* * *

Typically, this liquid material can be used for jacketing or potting many types of electrical connectors protecting them against environmental conditions, at the same time housing or capping the connector with an inexpensive cover. Where extra adhesion is required to the metal rim of a connector or any metal surface, a primer can be applied prior to the molding operation. The primer is an air dry material which can be applied by brushing, dipping or spraying, depending on the type of connector. It should be allowed to air dry for approximately 10 to 15 minutes prior to applying the plastisol to the metal surface.

* * *

The mold is usually a simple two-piece construction which can be clamped together over the wire core. The two pieces are often secured together by lugs, but a simple clamp or a vice arrangement would be equally satisfactory. A fill hole is located at one end of the mold, and at the opposite end there is a hole to release air and excess material. (Fig. VI). The

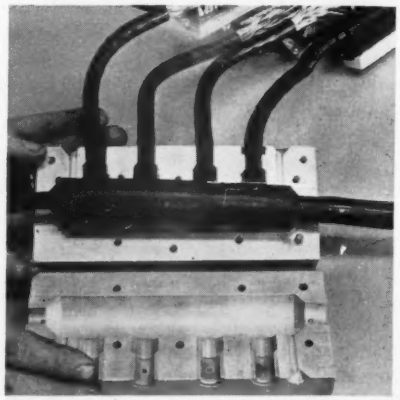

Figure VI * * * * * * * * * *

wires to be encapsulated can be wrapped with tying cord, or encased in short sections of tubing to hold them in proper alignment before they are locked in place by the plastisol. Once the mold is closed over the wire, it is charged with plastisol using an automatic low pressure feed system or something on the order of a cake decorator or plastic squeeze bottle. Fig. VII shows the liquidity of vinyl plastisols. As the liquid flows into

Figure VII * * * * * * * * * *

the mold, it will fill all voids throughout and surround the wires encapsulating the entire assembly. When a steady stream begins to emerge from the release hole, it is evident that the mold is completely charged and all voids are full. (Fig. VIII.)

(*Please turn to page* 1436)

Fabrication of Beryllium Wire

by A. G. Gross, Jr.
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Research and Development Department
The Brush Beryllium Company
Cleveland, Ohio

I. Introduction

This paper is concerned with describing a technique of fabricating wire from QMV beryllium metal.

* * *

Those who are familiar with beryllium metal will find the metallurgical aspects are either simplified to extreme or ignored completely. Those who wish to become educated on beryllium metal are referred to the many fine papers already published on this subject. "The Metal Beryllium," published by the American Society for Metals, is a "treasure-house" of information for those who have not worked with beryllium metal.

II. Description of Beryllium Metal

Beryllium is a chemical element. This element has an atomic number of 4 and an atomic weight of approximately 9.

* * *

This chemical element is found in nature as a component of exceedingly stable chemical compounds; the most familiar compound is beryl which is essentially an impure quartz rock and which contains about 4% by weight beryllium.

* * *

Winning beryllium from beryl ore is a complex process, well beyond the scope of this paper. Let it suffice to say that this impure quartz rock is chemically treated so as to recombine the beryllium content with fluorine. This yields beryllium fluoride which is then chemically treated to produce pebbles of commercially pure beryllium metal[1].

* * *

In order to make the powder metallurgy product, the pebbles are melted, cast, machined to chips, the chips are attrited to powder, and finally the powder is pressed at sintering temperatures to form blocks of solid metal.

* * *

This sintered block now may be described as one of several grades of QMV beryllium metal. The most significant difference between grades is the beryllium-oxide content. Table I presents chemical composition specifications for three structural grades of beryllium metal. This paper will deal primarily with the fabrication of S-200-B grade.

A. G. Gross, Jr.

The author was graduated from Purdue University with a Bachelor of Science degree in Mechanical Engineering in 1953. From August, 1953 to April, 1954, he was employed as Project Engineer by the Haynes Stellite Division of Union Carbide and Carbon. From April, 1954 until April, 1956, he served with the U. S. Army. After separation from the Army, he was employed by the Republic Steel Corporation as Titanium Metallurgist where he worked on the melting, rolling, forging, and heat-treating of titanium and its alloys. From May, 1957 until January, 1958 he was employed as Application Engineer by Johnston and Funk Titanium Corporation, Wooster, Ohio. His duties concerned development of titanium and zirconium wire applications. He joined the staff of the Research and Development Department of The Brush Beryllium Company in January of 1958 where he has worked on the physical metallurgy and fabrication of beryllium.

This paper was prepared for presentation at the Annual Convention of The Wire Association on November 15, 1960, at Chicago, Ill.

Figure 1 illustrates the general behavior of mechanical properties with temperature for vacuum-hot-pressed QMV brand beryllium metal[2]. The data presented are for lot Y-4522 which meets the chemical specifications of S-100-B grade. General experience has indicated that S-200-B and S-300-B grades behave similarly, although the peak values of tensile contraction may be somewhat lower. The significant feature, however, is the ductility peak observed at about 800°F. This peak furnishes the primary clue to the choice of a wire-drawing temperature.

* * *

A more signifcant indicator of drawability is the work-hardening characteristic of the material. One generally evaluates this parameter from true stress — true strain tensile testing where the resulting isothermal tensile curves are described by equation 1.

* * *

It may be shown mathematically[3] that drawability is a maximum when the strain-hardening exponent (n) is maximum. Fortunately, it has been found that the value of the strain-hardening exponent for S-200-B beryllium follows the same pattern with temperature as the tensile contraction; that is, the exponent reaches a maximum value between 800° and 900°F. This dictates the nominal drawing temperatures.

* * *

A comparison of strain-hardening rates is presented in Table II. These data show that, at best, S-200-B beryllium (at 850°F) work hardens considerably more slowly than most common metals.

* * *

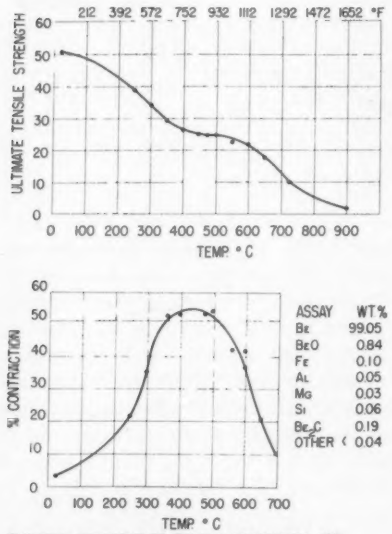
This fact tells us immediately that relatively light drafting will be required, all other things being equal.

TABLE I

CHEMICAL COMPOSITION SPECIFICATIONS FOR SEVERAL STRUCTURAL GRADES OF QMV BRAND BERYLLIUM[a]

Element	Chemical Analysis (% by weight) Grade S-100-B	Grade S-200-B	Grade S-300-B
Be (assay)	98.5 min	98.0 min	97.4 min
BeO	1.2 max.	2.0 max.	3.0 max.
Al	0.14 max.	0.16 max.	0.18 max.
C	0.15 max.	0.15 max.	0.20 max.
Fe	0.16 max.	0.18 max.	0.20 max.
Mg	0.08 max.	0.08 max.	0.08 max.
Si	0.10 max.	0.12 max.	0.15 max.
Any other metallic impurity	0.04 max.	0.04 max.	0.06 max.

[a] From specifications published by The Brush Beryllium Company, Cleveland, Ohio.



ELEVATED TEMPERATURE TENSILE PROPERTIES FOR VACUUM HOT PRESSED QMV BRAND BERYLLIUM

FIG 1

EQUATION 1

$$\bar{\sigma} = A\bar{\epsilon}^{n} \qquad (1)$$

where:

$\bar{\sigma}$ = true stress; instantaneous load divided by instantaneous cross-section area

$\bar{\epsilon}$ = true strain; $\log_e \left(\frac{\text{instantaneous length}}{\text{original length}}\right)$

A = a material constant

n = strain-hardening exponent

To conclude this brief introduction to beryllium metal, a comparison between low-carbon steel and S-200-B beryllium is offered as a fabricator's "touchstone." It has been found fruitful to consider beryllium as having roughly the same forming characteristics at 800° F that low-carbon steel has at room temperature with the important distinction that beryllium is generally less ductile and work-hardens more slowly. Conversely, forming beryllium at room temperature is roughly similar to forming low-carbon steel in liquid nitrogen. Naturally, one can not carry the analogy to exact detail, but it does help to establish a "feeling" for beryllium metal. It must be remembered that 800° to 900° F is a COLD-WORKING temperature range for beryllium in the exact metallurgical sense of the term.

III. Choice of Method of Fabricating Draw Stock

The most primitive method of draw stock manufacture would be to machine bars from the vacuum-hot-pressed blocks.

* * *

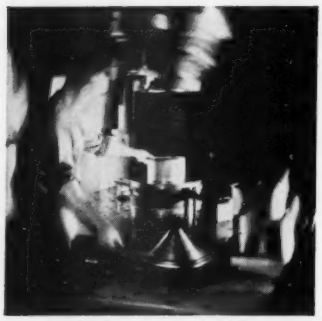
A more advanced method would be to extrude billets which were machined from vacuum-hot-pressed block, thus providing a truly wrought input material. Extrusion of beryllium may be accomplished at 850° F using reduction ratios between 6:1 and 10:1, or at 1900° F using reduction ratios between 13:1 and 20:1.

* * *

It has been found that all three methods yield drawable bar stock. Bar stock, extruded at 1950° F, is generally available only in relatively large sizes such as ¾-inch diameter, but may be obtained in long lengths. Draw stock, machined from vacuum-hot-pressed block, is available in smaller diameters but not in long lengths.

* * *

Bar stock, extruded at 850° F,



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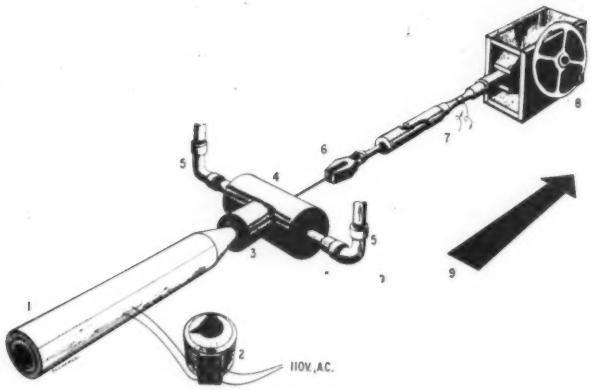


FIG. 2 - DIAGRAM OF WIRE-DRAWING SETUP

1. TUBULAR PREHEAT FURNACE
2. POWERSTAT (110 V. A. C.)
3. LUBRICANT BOX - ENTRY GUIDE - DIE HOLDER
4. DIE BLOCK (FIXED)
5. GAS BURNERS
6. GRIPS
7. STRAIN BAR WITH UNIVERSAL JOINT
8. CARRIAGE
9. DRAWING FORCE

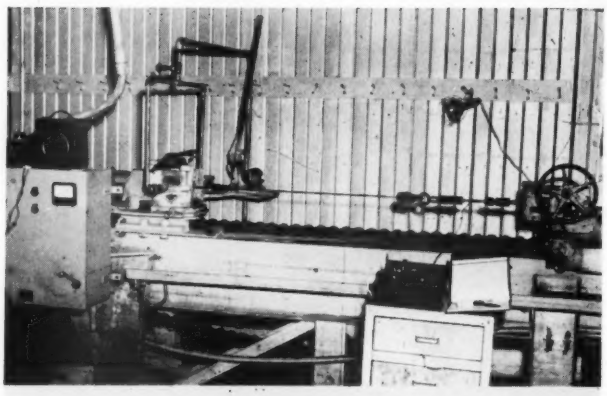


FIG. 3 APPARATUS FOR BERYLLIUM WIRE DRAWING (COURTESY OF AMETCO, INC., BOOSTER, OHIO)

has been found to be the best choice. This bar is available in diameters as small as 0.250 inch and in reasonable lengths. Bar stock prepared in this way has been found to possess quite reliable drawability.

IV. Choice of Equipment

The choice of equipment is dictated largely by temperature considerations. This is not meant to imply complexity; on the contrary, the simpler the better. None the less, temperature control must be positive, and parts of the equipment must be capable of operating at elevated temperatures for long periods of time.

* * *

In general, two schemes are practical: straight-bench and capstan-block.

* * *

The simplest, but certainly not the most productive, scheme is the straight-bench. An illustration of this arrangement is shown in Figure 2. This setup requires an absolute minimum of deviation from room-temperature operation. The sole modifications are the introduction of a preheat furnace and the application of heat to the die block. A practical example of these modifications is shown in Figure 3.

* * *

Capstan-block drawing equipment requires more modification but is still practical. As before, one must employ a preheat furnace and apply heat to the die box; but in addition, the capstan and capstan-approach area must be heated. Even if these restrictions are met successfully, there exists another problem: making the first wrap on the capstan. It has been found that conventional wire-drawing grips (or "dog") are not acceptable in that they necessitate making a sharp bend in the "point" as the grips make initial contact with the capstan. This generally causes the point to fracture. One possible solution to this problem is to use grips which bend in the middle so as to prevent bending the point.

* * *

As always, drawing forces must be known in order to make an appropriate choice of drawing equipment. Table III presents drawing force levels which may be expected. Figure 4 graphically presents these data. If one is to draw within the range of diameters listed, the draw bench or block should be capable of developing forces of about 5000 pounds.

V. Die Design

Tungsten carbide dies have proven quite satisfactory. Diamond dies have not yet been tried.

* * *

A full-entry angle of 12½ degrees has been employed, and deformation efficiencies of 0.30 to 0.35 are generally experienced with this angle and zero bearing length.

* * *

Some experiments have been made using a full-entry angle of 25 degrees and zero bearing length.

TABLE II

SOME REPRESENTATIVE VALUES OF THE STRAIN-HARDENING EXPONENT FOR VARIOUS METALS

Material	Temperature (°F)	Strain-Hardening Rate (n)
Ideally Plastic (for instance, steel at forging temperature)	Any temp.	0.00
Aluminum	Room	0.21
Copper	Room	0.35
Stainless steel	Room	0.55
3-200-B beryllium	850	0.10

TABLE III

CALCULATED DRAWING FORCES FOR IDEALIZED PRODUCTION EQUIMAPPING (25%) SCHEDULE

Assume: $n = 0.200$ and $\bar{\sigma}_d = 3\,(w_b)$ where w_b is the minimum work/unit volume complete recovery upon annealing and $\bar{\sigma}_d$ is the draw force divided by the cross-section area of the drawn wire.

Pass	Diameter		Computed Draw Force
0	0.500	(Annealed)	--
1	0.433		3700
2	0.375		3570
3	0.325		3280
		Anneal	
4	0.282		1567
5	0.244		1513
6	0.212		1,195*
		Anneal	
7	0.183		670*
8	0.159		642*
9	0.138		591*
		Anneal	
10	0.119		279
11	0.1035		272
12	0.0897		250*
		Anneal	
13	0.0778		137
14	0.0674		128
15	0.0584		115
		Anneal	
16	0.0506		58
17	0.0438		54
18	0.0380		49
		Anneal	
19	0.0329		25
20	0.0285		23
21	0.0247		21
		Anneal	
22	0.0214		12
23	0.0185		11
24	0.0161		9.5
		Anneal	
25	0.0139		5
26	0.0121		4.5
27	0.0105		4
		Anneal	

Note: See reference 3 for computation procedure.
* Verified by measurement during drawing.

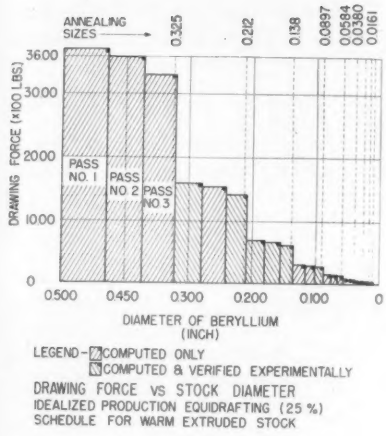
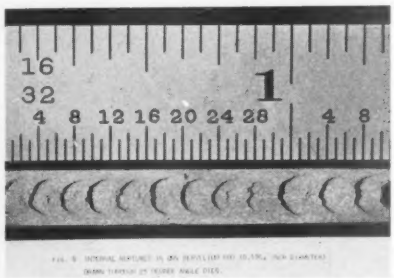


FIG. 4

The lubrication was much better as shown by a deformation efficiency of 0.55 to 0.60 for the first pass. However, by the third pass, defects such as those illustrated in Figure 5 were well developed.



It seems probable that some angle slightly larger than 12½ degrees will be found optimum.

VI. Preparation of Stock For Drawing

All draw stock should be given a recovery anneal prior to drawing. This may be accomplished by holding the material at a temperature between 1450° and 1480°F for 30 to 60 minutes followed by slow cooling (asbestos blanket or granular insulation).

* * *

The anneal produces a very tight, uniform scale which should be removed. A molten-salt descaling bath such as sodium hydride or "Virgo" is excellent. The descaling is followed by a flash pickle in HF-HNO_3 (2 and 20% by volume, respectively).

* * *

The cleaned stock may be pointed for entry in one of two ways: hot rolling or chemical etching. The hot-rolling technique consists of heating the intended point with a gas burner and pointing in a standard roll-pointing machine. This technique is extremely tedious and requires a high degree of manual dexterity. Chemical etching is far more satisfactory. A relatively concentrated solution of HF has proved to be effective. The point should not be small enough to enter more than two successive 25% drafts.

* * *

The next step is to apply lubricant to the pointed stock. As will be shown later, the lubricant must function at temperatures in excess of 750° F, and this restricts the choice of lubricant systems. In general, the heated die box is filled with lubricating grade flake graphite, and the stock is coated with a solid lubricant.

* * *

Some of the available coatings are:

1. Colloidal graphite in water
2. Colloidal graphite in oil
3. Graphite and molybdenum disulfide with a phenolic resin binder

* * *

The first two coatings yielded deformation efficiencies of 0.40 to 0.50 when using a die angle of 12½ degrees.

* * *

The resin-bound coating yielded deformation efficiencies of 0.30 to 0.35 using the same die design. This coating was preferred because it seemed to be the most reliable.

VII. Drafting Procedure

The remainder of this paper describes techniques using 12½ degree tungsten carbide dies and the graphite and molybdenum disulfide with phenolic resin for lubrication.

* * *

For purposes of production, a 25% R.A. equidrafting schedule with recovery annealing after every third pass, has been found acceptable. Naturally, this practice is strongly sensitive to lubrication efficiency; the more efficient the lubricant, the greater the magnitude of equidrafting.

* * *

Special drafting has been accomplished to produce high-strength wire. This practice consists of three 25% R.A. drafts followed by a series of 12% R.A. drafts which are continued until 85% (or more) cumulative reduction in area has been accomplished.

VIII. Drawing Temperature And Draw Speed

As was previously mentioned, the draw stock must be preheated to approximately 800° F prior to die entry. The die and die box should be maintained at this temperature or slightly lower, at least for the initiation of each pass.

* * *

This practice has allowed drawing speeds up to 10 feet per minute. So far, the upper limit of drawing speed has been governed not by strain rate but by local surface temperature, which as always, is capable of destroying lubricity, and with beryllium, can cause the stock to lose ductility (see Figure 1).

* * *

It seems logical to conclude that the maximum drawing speed can be increased by judiciously decreasing the die temperature.

IX. Cleaning Techniques

There are only two cleaning procedures which have been found acceptable. The first is shot blasting, sand blasting or vapor sand blasting. This technique will prepare the wire for subsequent uniform pickling. Due caution must be exercised when using this method in that it has been found possible to peen the wire surface to very high brittleness by vapor sand blasting.

* * *

A second technique is to descale the wire in molten salts, such as sodium hydride or Virgo salts. It has been found that 60 to 90 seconds immersion in Virgo salts at 900° F is completely efficient. The salt dip is followed by air cooling to room temperature, dissolution of residual salt in water or dilute sulfuric acid, pickling in a dilute hydrofluoric-nitric acid bath, and cold-water rinsing.

* * *

The hydrofluoric-nitric pickle

may be used to prepare the wire surface for redrawing or to brighten the surface as a finish. It has been found that 2 volume % HF, 20 volume % HNO_3 and the balance water is a satisfactory mix.

X. Process Heat Treatment

Experiments have shown that process heat treating, preparatory to redrawing, may be accomplished at any temperature between 1300° and 1500° F.[3]

* * *

Two specific treatments are generally recognized: stress relieving at 1300° to 1350 ° F for 1 hour — air cool, and recovery annealing at 1450° to 1500° F for ½ hour — air cool.

* * *

The stress relief does not produce uniform mechanical properties when accomplished in an "air furnace," but this treatment does allow redrawing without complete recovery.

* * *

The recovery anneal has been found to produce uniform properties, to produce nearly complete recovery, and to produce, at least occasionally, some recrystallization. This treatment is preferred for production work where high strength is not the primary consideration.

XI. Recapitulation

I. In conclusion, beryllium wire drawing is performed at 800° F in order to take advantage of the drawability at this temperature. Mechanical deformation of beryllium at this temperature is truly cold working in the same sense as deforming steel at room temperature.

* * *

2. Draw stock is fabricated from block-pressed beryllium by extruding at 850° F with a 6:1 reduction ratio.

* * *

3. Wire-drawing equipment must be amendable to operation at elevated temperatures, and must have an upper capacity limit of about 5000-pounds draw force at a relatively low drawing speed. The equipment must allow the stock to be heated to 850° F, the die and die box to be heated to 700° F, and the capstan (if one is used) to be heated to 800° F. Accurate temperature control must be included.

* * *

4. Standard tungsten carbide dies of 12½ degree, full-entry angle and zero bearing length are acceptable.

* * *

5. The draw stock should be pointed by etching and coated with a solid film lubricant; preferably, a graphite-molybdenum disulfide mixture with a phenolic resin binder. Naturally, the stock must be annealed and cleaned prior to this operation.

6. The production-drafting cycle consists of three 25% R.A. passes followed by annealing.

* * *

7. Using current practices, drawing speeds do not exceed 10 feet per minute.

* * *

8. The preferred cleaning technique employs molten descaling salts to "strike" heat scale or lubricant. This is followed by pickling in a dilute hydrofluoric-nitric acid bath.

* * *

9. Process annealing is generally performed at 1450° F to 1500° F for 30 minutes, followed by air cooling.

* * *

10. These techniques have been employed to draw beryllium at all sizes between 0.750 inch diameter and 0.010 inch diameter. Beryllium wire, at diameters down to 0.010-inch, is being produced by Armetco, Inc., Wooster, Ohio, and is commercially available through our Company.

XII. References

1. "The Metal Beryllium," A. S. M. Publication
2. W. W. Beaver and K. G. Wikle, *J. Metals*, 559-573, May 1954
3. A. G. Gross, Jr., R. G. O'Rourke, and W. W. Beaver, Final Report — "Fabrication of Beryllium Wire," Navy Contract N. O. as 56-6030-C

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Some Notes on Heat Treating Wire and the Equipment Therefor

by W. A. Darrah, Vice President
Lindberg Industrial Division
Lindberg Engineering Company
Chicago, Illinois

Introduction

Many thousands of years ago, in crude shops along the banks of the muddy Nile, sturdy Egyptian craftsmen produced wires, principally of copper, but also of gold and silver. Their procedure was anything but direct, but it is doubtful if modern metalworkers could do as well, if limited to the tools and materials available to the Egyptians.

* * *

It has been a long road, with many interruptions, from the work hardened pins, needles, and instrument strings of the Pharaohs to the metalworking shops of today, with continuous metallurgical control of each step and with wire drawing rates approximating a thousand feet per minute, as compared to twenty inches per day of the workers of ancient Egypt — (no forty hour week there).

* * *

Modern methods are made possible primarily by use of controlled heat applications, and continuous checking of grain size and conditions. Also, as discussed later, carefully controlled atmospheres play an important part in today's metalworking methods.

Cleaning

In the case of many metallurgical operations, the initial step is to clean the wire from scale, dirt, grease and all foreign matter. Many of these impurities, (as for example, grease) can best be removed by a "burn off", which consists in heating the wire in air to temperatures around 700°F to 800°F, depending on the nature and condition of the wire. For example, many copper alloys scale at much lower temperatures than steel (some around 300°F).

W. A. Darrah

This paper was prepared for presentation at the Annual Convention of The Wire Association in Chicago, Ill., on November 16, 1960.
Mr. Darrah formerly was president of Continental Industrial Engineers, Inc., Chicago, designers and manufacturers of industrial heating equipment, which recently became a division of Lindberg Engineering Company. He is well known both as a manufacturer and as the author of a number of papers on various phases of heat treating. He has been a member of The Wire Association for the last 18 years.

Many of the lubricants used in early manufacturing operations reappear as materials which must be removed in succeeding steps such as pickling. Incidentally, where feasible, water-soluble lubricants are to be preferred over straight petroleum products because of the ease of ultimate removal, and the ammonia salts of the fatty acids (soaps) are to be preferred over the alkali salts. Observance of these simple steps will some times facilitate reduction of stains, and markings, which are hard to remove in the finishing operations, particularly in the case of nonferrous wire.

* * *

In current practice, a pickle bath for carbon steel, and for copper alloys, contains around 18% sulphuric acid. Hydrochloric acid is sometimes added to accelerate pickling.

Cleaning Stainless

Copper alloys are frequently brightened with an additional dip in sodium bichromate dissolved in sulphuric acid solution. For stainless steels, hydroflouric acid is usually required with the sulphuric acid in which case the pickle bath is used at room temperature instead of 120°F, as used in the case of plain carbon steel. Of course, the steps of rinsing, brushing and drying are usually necessary, whenever an acid pickle line may be used.

* * *

Two continuous mechanical types of acid pickle lines are used. In one type (used for thick, flat bars or rods), the rods pass through the line on rollers or other support, and the various solutions are pumped over the bars.

* * *

In the case of light gauge, continuous strip or wire, the stock passes through tanks or troughs and is bent to follow the contour of the various tanks. Figure I shows a continuous pickle line in which the wire follows the tank contour while Figure II shows a heavy gauge strip being pickled by flowing acid over it.

* * *

The secondary treatment of steel wire after heating can be very important, as illustrated in Figure III. It will be noted that most of the physical properties of spring wire, rise rather sharply to a peak at around 400°F, and then taper off, until at 700°F, many of the properties have a tendency to return to approximately their initial condition.

* * *

In modern practice, annealing is

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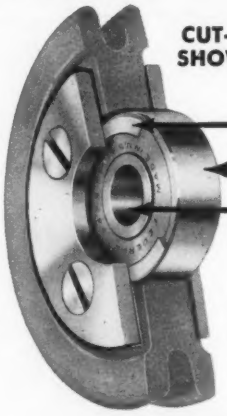

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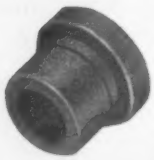

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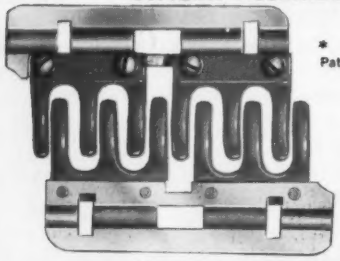

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Figure I. — Finished Pickle Unit at discharge end is the dryer. * * * * * * *

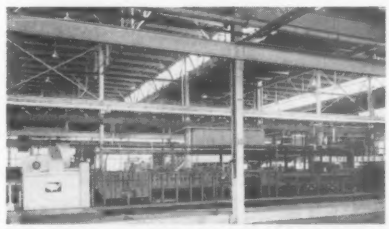


Figure II. — Continuous pickle Line for rod and heavy wire. * * * * * * *

essential. Cold drawing, or other forms of cold working makes the wire brittle and hard to process further.

* * *

It is, of course, commonly known that the temperature—time cycle required for proper annealing depends largely on the degree and conditions of cold working; in other words, on the previous history. Thus on copper after much cold working, a **long** anneal at 1000°F will give good results, whereas lightly cold worked copper may be annealed in a **short** time by using 1200°F furnace temperature.

* * *

Using a properly controlled (reducing) atmosphere, it is entirely feasible to combine wire cleaning with annealing. A rich exothermic atmosphere delivered at around 1200°F will reduce to metal, oxide scales on many copper alloys.

* * *

The technique of annealing—reduction must be carefully controlled, or the reduced metal from the oxides will form a separable film. Note that this procedure has a definite economic advantage over an acid pickle, in that the annealing-reduction process converts the oxide to useful metal, whereas the acid pickle destroys the metal in the form of scale by converting it to sulphate that is usually thrown away; the difference may amount to many thousands of dollars over a year's operation.

* * *

Another method of recovering the metal from oxide scales (in this case both ferrous, or non ferrous) is the use of a polarized salt bath. Thus, in a delayed quench, a salt bath consisting largely of sodium carbonate fused with sodium cyanide, with a direct current to the metal to be reduced, will give clean, bright metal, with or without carbide absorption, at temperatures around 1400°F. Note this temperature is close to a normal annealing temperature for many steels.

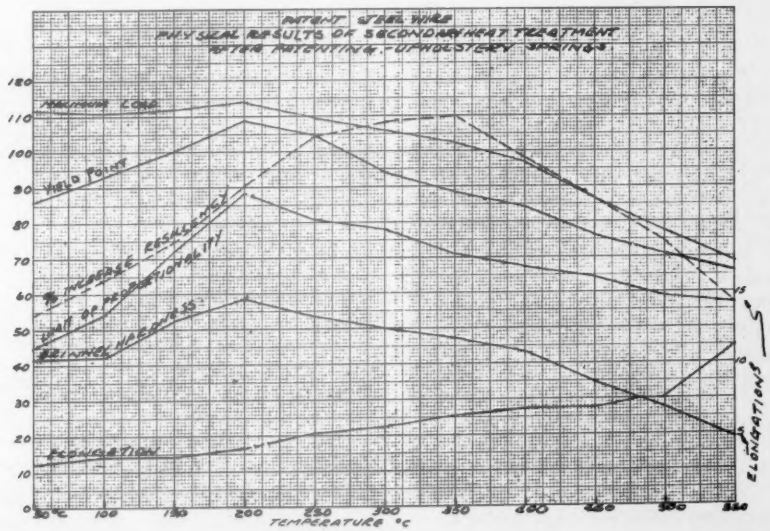


Figure III. — Curves showing effect of heating on properties of wire. * * *

The salt bath method of annealing reduction is effective on many carbon steels, as well as on copper alloys. A properly proportioned salt bath will permit cooling 25% faster than a lead bath.

* * *

As most salt baths are subject to drag out, it would appear that where a controlled atmosphere will suffice, it is to be preferred unless the salt bath is required for a delayed quench or other heat treatment.

* * *

In any convection heat treatment, in a gaseous atmosphere, a violent atmosphere circulation is very desirable. A "rule of thumb" regarding atmosphere circulation suggests 10,000 CFM per million BTU per hour as a minimum.

* * *

In a common annealing cycle, the time required for cooling is ordinarily about twice as long as for heating. This naturally reduces the available production from any equipment which may be in use. It is common practice in many plants to spray the inner hood with water in a carefully distributed flow, so as to absorb the heat uniformly.

* * *

A heat application using a salt bath is the coating of steel wire with zinc or with aluminum. This is a relatively simple operation which consists in passing the clean steel wire first through a hot bath (1400°F) largely of barium and sodium chlorides, and then vertically upward through a pool of melted aluminum floating on the barium salt. The wire must be scrupulously cleaned. When properly carried out, the surface of the wire is found to be coated with an adherent alloy of steel and aluminum, while on the surface of the alloy layer will be a layer of metallic aluminum. This operation is carried on at a temperature of 1400°F in the aluminum pool and 1200°F in the salt. A somewhat similar method may be used for galvanizing. One of the most common heat operations (for copper alloys, and ferrous metals) is annealing; which may be carried out continuously or as a batch operation. See Figure IV for good U. S. practice.

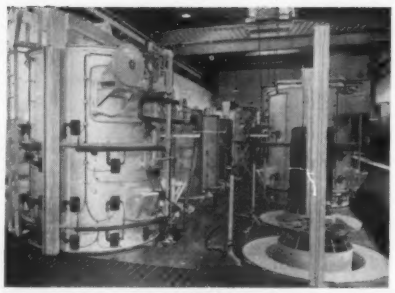


Figure IV. — Installation of U. S. "Top Hats." Note base construction. * * *

The continuous method gives better uniformity, since each section of wire receives exactly the same time-temperature treatment, while in the case of the batch process certain delays occur in transmitting heat to the center of the large coils.

Patenting

One widely used annealing procedure, known as patenting, consists of drawing 20 or 30 strands of wire individually through a heated chamber, maintained filled with controlled (inert) atmosphere.

* * *

Figure V shows such a furnace with an effective length of forty feet and twenty four inches wide. Such a furnace has a typical output of 1000# per hour, and a maximum power demand of 150 KW per hour, when annealing 8-13 gauge steel wire. The figure shows

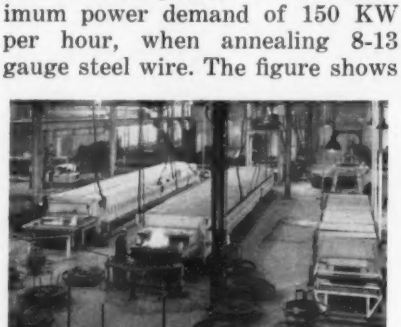


Figure V. — Efco patenting furnace with lead bath at discharge end. Courtesy of Efco Ltd., Weybridge, England. * * * * *

a unit which is a product of the Electric Resistance Furnace Co., Ltd. of Weybridge, Surrey, England. It illustrates common British practice which allows a gap of around 10′ between the end of the patenting furnace and the entrance to the lead bath. See Figure VI. Note that heat is continuously added to the lead bath from the hot wire and because of this must be continuously removed; the lead

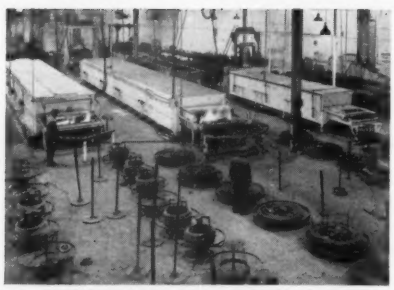


Figure VI. — Recent installation of Efco patenting furnaces, with lead bath at end of line. Courtesy of Efco Ltd., Weybridge, England. * * * * * * * *

bath should operate around 650°F with a temperature of 1600°F (depending on the wire) in the patenting furnace. The EFCO Patenting Furnaces range in sizes of 17′ in length and 6′ in width and a rating of 500 KW with a production of 1 ton per hour, to 24′ in length, 2′ in width and rating of 500 KW. It must be remembered that the soak at the end of the heating cycle is of great importance in getting the desired results from the Patenting Cycle.

* * *

When properly carried out, patenting greatly increases the amount of cold reduction which is permissible without further heat treatment.

* * *

From the patenting furnace, the wire may be air cooled, cooled in a lead bath, or in a salt bath; depending on the desired character of the wire being processed. The salt bath will give the most rapid cooling, but usually requires a further wash to remove the "carry out" of salt. The lead bath gives ideal results. Figure VI shows in the background a typical electrically heated lead bath (about 10′ long) suitable for use with a patenting furnace 40′ long and rated at a thousand pounds an hour. Figure VII shows American practice. A stream of room air passed through submerged steel pipes in the lead bath will remove the excess heat. Incidentally a typical electrically heated patenting furnace will process 10 to 20# per hour per square foot of effective hearth area, depending on the gauge and character of the wire. The important soaking period is the factor, which gives the output of a patenting furnace its desired characteristics. Most patenting furnaces in the

(*Please turn to page* 1423)

Awards for 1959 Papers Announced by The Wire Association

Howard J. Godfrey

The selection of papers meriting awards that were presented in 1959 and published in **Wire and Wire Products** has been made by **The Wire Association's** Committee on Awards and duly submitted to and approved by a majority of the directors at its semi-annual meeting in Los Angeles on May 4, 1960.

* * *

Dartrey Lewis, Chief Engineer, Research and Development, **John A. Roebling's Sons Division,** the Colorado Fuel & Iron Corporation, Chairman of the Committee, announced that the following four men had been voted as having prepared the best papers of the preceding year, based on the Oxford System of judging papers:

Medal Awards

Howard J. Godfrey, Asst. Chief Development Engineer, **John A. Roebling's Sons Div.,** The Colorado Fuel & Iron Corp., for the best Ferrous Division paper, "High Temperature Tests on Aircraft Control Cables."

* * *

Dr. Erwin J. Saxl, Pres., **Tensitron, Inc.,** for the best Non-Ferrous Division paper, "Tension in Wire Engineering."

Certificates of Honorable Mention

Denis G. van de Moortel, Technical Chief Manager, **United Ropeworks,** for the Ferrous Division paper, "New Method for the Fatigue Tests on Steel Wires and Wire Ropes and the New Viewpoints Opened by the Results Obtained."

* * *

Alexander F. Sperduti, Assistant Chief Engineer, **The Fenn Manufacturing Co.,** for his Non-Ferrous Division paper, "The Rolling of Round Wire into Flats and Rectangles."

* * *

The awards will be formally presented at the Annual Convention of **The Wire Association** in Chicago, Illinois, on November 16th at the Annual Dinner. Each award will be accompanied by checks of $100.00 and $50.00 for the Medal Awards and Certificates of Honorable Mention, respectively.

Requirements For Consideration of Papers

The first consideration of eligibility is that the author or authors must be Association members. A second is that it must be a contribution to the Association or to **Wire and Wire Products,** as articles for which the magazine has paid an honorarium cannot be considered. A third is that any paper that has been previously presented before another society or published in another magazine cannot be taken under advisement for awards.

Alexander F. Sperduti

Denis G. van de Moortel

Judging Papers

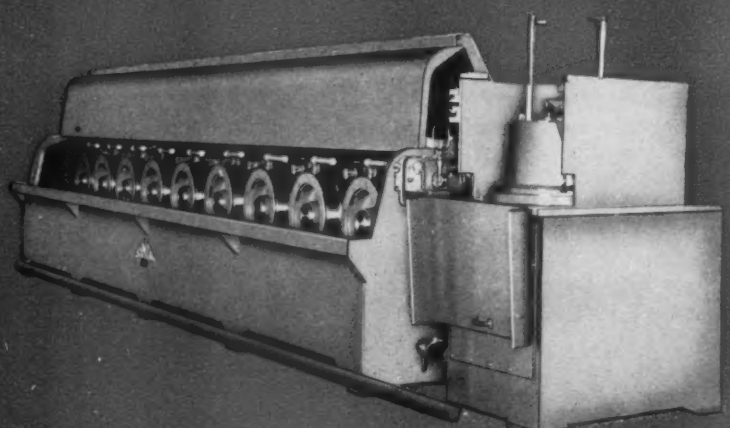
Papers eligible for awards are judged by the Oxford System, which is considered the best one so far devised for the impersonal determination of the worthwhileness of papers. Consideration is given to the following points, among others:

1. **Value of the paper to The Wire Association's members as a whole.**
2. **Does it contain new information that has not been published hitherto, or is it merely a restatement of technical material?**
3. **Does it constitute an advancement in knowledge by clarification of past information?**
4. **Does it provide a re-assessment of known facts in such manner as to be readily understood by the industry as a whole?**
5. **Are the claims in the paper factually supported with definite, impartial test data and established experience?**
6. **Is the paper valuable as a reference work?**

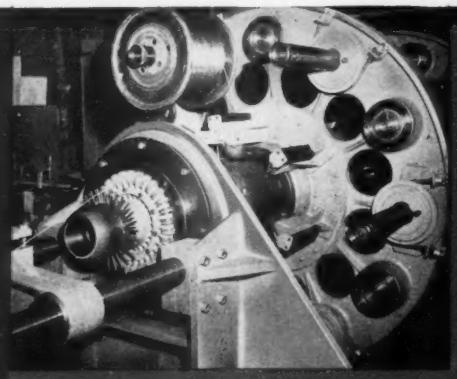
Members of the Awards Committee are:

(*Please turn to page* 1460)

For Wire and Cable Mills the world over there exists a perpetual challenge . . . greater speed, efficiency and profit through automation. Syncro's complete line of wire and cable mill machinery is designed

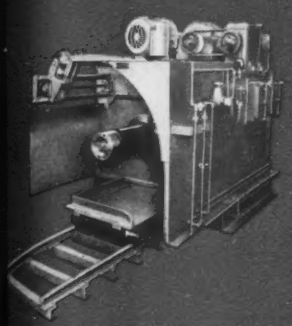


Tandem Rod Breakdown Machine for drawing copper, aluminum and their alloys. Model 18T-10 is designed for easy, fast stringing and handling of heavy sizes (up to ½" dia. soft copper).



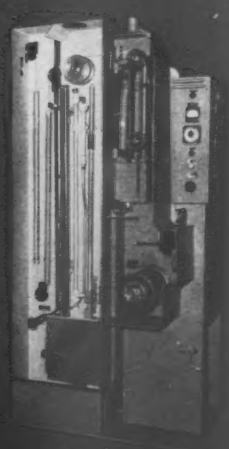
Rigid frame strander. Strander sections accommodate up to 30 bobbins in any required combination. All sections arranged for synchronized speeds, individual electro-pneumatic braking systems.

to meet the challenge— the **SYNCRO** design for total production.

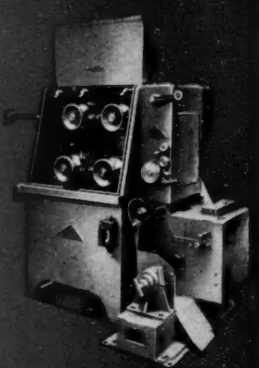


Heavy Duty Spooler accommodating up to two ton spools. High speed operation at maximum efficiency.

Annealer with self-contained spooler unit mechanically driven through eddy current clutch coupling. Operating speeds to meet maximum wire-drawing requirements.



Intermediate wire drawing machine Model C-12 equipped for high speed spooling.



Fine wire drawing machine with spooler. Minimum slip design assures maximum block and die life.

"Better Machinery for the Wire Industry"

affiliated company: Winget Syncro Ltd., Rochester, Kent, England.

wire drawing machines • stranders • continuous electric annealers • payoffs, capstans, wire insulators • heavy duty takeups • tapers • special machinery.

THE WIRE ASSOCIATION

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Titles and connections of Past Presidents are those at the time each held office.

The Wire Association is a non-profit organization of wire mill executives, superintendents and foremen. It also includes plant engineers, traffic men, and all others engaged in the production of cold drawn bars, rods, wire, strip, insulated wire and cable, and the manufacture and fabrication of finished wire products, including cold headed, extruded and other cold worked metal products.

There are separate divisions for all the various major interests in the wire industry, steel, iron, brass, copper, alloy, and precious metals, together with divisions relating to drawing, cold working, cold heading, extruding, fabricating, forming, spring making, wire cloth, wire rope, bare and covered electric wire and cable and all other forms of wire and wire products.

ACTIVITIES

The Association functions along the following lines:

1. The use of the Association headquarters as a central clearing house for information and data of all kinds which may be of interest to members.
2. The exchange of ideas on processes of production including machinery, technical processes, etc.
3. The establishment and maintenance of friendly relations among the members of the association and the development of sectional and national meetings to discuss matters of mutual interest.
4. Studies of production methods and analysis of production costs.
5. Developments in the use of new materials and new applications of existing materials and by-products.
6. Research and collection of information on personnel management, including such factors as labor turnover, seasonal changes in the demand for employees, wage scales, etc.
7. Production simplification as a means for the effective elimination of waste.
8. Such other subjects as may be determined upon.

Greetings:

It is once more my pleasure to extend on behalf of the Officers and Directors a most cordial welcome to the 1960 Annual Convention of the Wire Association.

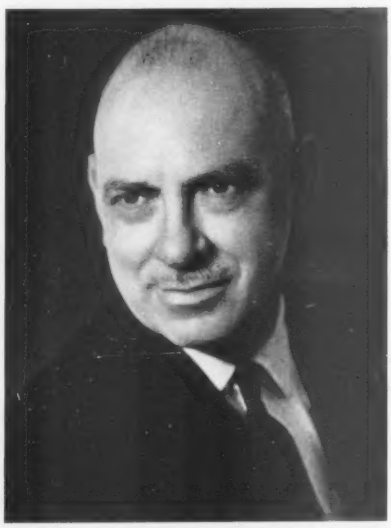
As many of the papers are published in the October issue this year well in advance of the meeting, we trust that this will give you an opportunity to study these fully so that you may better enter into the discussions at the Convention. Again this year the sessions will be divided into three distinct groups, Ferrous, Non-Ferrous and Electric Wire & Cable, so that you may attend the lecture of your choice. Advance written discussion will be welcomed and should provide more opportunity for such discussion this year than ever in the past.

Our thanks and appreciation go to Republic Steel Corporation and Western Electric's Hawthorne Works for their kindness in permitting us to tour their plants during the Convention.

Since this will be the last time that I may welcome you as President of the Association, I feel that I should mention well in advance the proposed change of program for 1961 when the meeting will be held at the Sheraton Hotel at French Lick Springs in Indiana, a step which has been urged by many of our members for a period of years. It is the feeling of your Directors that this change of venue will be an acceptable break in the long chain of meetings which have been held in urban centres, and the program is being arranged accordingly.

The 1960 program of technical papers has been arranged under the very able chairmanship of Mr. G. G. Stendahl of Western Electric and I am sure it will provide all wire men with the most up-to-date information available.

I look forward to seeing you in Chicago.



ALLAN B. DOVE

President
THE WIRE ASSOCIATION

THE ANNUAL CONVENTION OF THE WIRE ASSOCIATION

LA SALLE HOTEL, CHICAGO, ILL., MONDAY THROUGH THURSDAY
NOVEMBER 14-17, 1960

The Wire Association's Headquarters at The La Salle Hotel
will be open each evening from Sunday, November 13, except Wednesday night.

YOU ARE CORDIALLY INVITED TO CALL AND MEET OTHER WIRE INDUSTRY MEN

THERE WILL BE A REGISTRATION FEE OF $18.00 FOR MEMBERS AND $20.00 FOR NON-MEMBERS, INCLUDING AN ANNUAL DINNER TICKET, FOR ALL THOSE ATTENDING THE TECHNICAL SESSIONS AND MEETINGS. PLEASE HAVE YOUR ASSOCIATION MEMBERSHIP CARD WITH YOU AND SHOW IT WHEN REGISTERING.

ADMISSION WILL BE BY BADGE ONLY — PLEASE WEAR IT.

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Boston Insulated Wire & Cable Co.
Boston, Mass.

Technical papers are preprinted in the October issue of Wire and Wire Products insofar as possible. Titles to papers accepted will be given to The Wire Association and duly copyrighted at the time of publication. All papers presented at the Convention by members of The Wire Association are eligible for consideration for the Annual Medal Awards and other awards made each year for outstanding excellence.

All wire mill men and wire mill suppliers are invited to attend this convention, see how the Association functions and participate in the activities. Simultaneous technical sessions for Ferrous, Non-Ferrous and Electric Wire & Cable Divisions are held. The Annual Dinner will be held on Wednesday evening and the Plant Inspection Trips on Thursday.

REGISTRATION AND TECHNICAL SESSIONS FOR ELECTRIC WIRE & CABLE SECTION ON MEZZANINE FLOOR. FERROUS AND NON-FERROUS BARE WIRE TECHNICAL SESSIONS ARE ON THE 19th FLOOR. *Please be prompt in arriving on time for the technical sessions. Those firms having rooms for entertainment are requested* NOT TO KEEP THEM OPEN *during th technical sessions.*

MONDAY, NOVEMBER 14

9:00 A.M.
REGISTRATION

10:00 A.M.
DIRECTORS' MEETING

12:30 P.M.
PROGRAM COMMITTEE LUNCHEON

THE WIRE ASSOCIATION

CONVENTION PROGRAM

November 14-17, 1960, La Salle Hotel, Chicago, Illinois

NOVEMBER 14, MONDAY

9:00 A.M. Registration Desk opens

10:00 A.M. Meeting of the Board of Directors of The Wire Association

12:30 P.M. Directors' Luncheon for Program Participants. Address of Welcome by President Allan B. Dove

JOINT FERROUS AND NON-FERROUS TECHNICAL SESSION

2:00 P.M. Address of Welcome by Allan B. Dove, President of The Wire Association.

MODERATOR

Allan B. Dove, Prod. Devel. Met., Steel Company of Canada, Ltd., Hamilton, Ont., Canada

PRESENTATION OF THE TWENTY-FIVE YEAR CERTIFICATES

THE MORDICA MEMORIAL LECTURE

"PLASTIC COATED STEEL WIRE" by DARTREY LEWIS, Chief Engineer, Research & Development, John A. Roebling's Sons Div., The Colorado Fuel & Iron Corp., Trenton, N. J.

PAPER: "American and European Steel Wire Manufacturing — a Comparison" — by Raymond S. Worth, Mfg. Mgr., Wire Mills Div., John A. Roebling's Sons Div., The Colorado Fuel & Iron Corp., Roebling, N. J.

MOTION PICTURE: "Voice Beneath the Sea" — Courtesy of Western Electric Company

MOTION PICTURE: "Submarine Cable Systems Development" — Courtesy of Western Electric Company

FERROUS DIVISION TECHNICAL SESSIONS

9:00 A.M., TUESDAY, NOV. 15

MODERATOR

Paul E. Moore, Asst. Chief Met., Youngstown Sheet & Tube Co., Youngstown, Ohio

PAPER: "Methods of Setting up Incentive Rates in the Steel Wire Mill" — by Malcolm J. Pollock, Senior Indus. Engineer, Wire Mills, John A. Roebling's Sons Div., The Colorado Fuel & Iron Corp., Trenton, N. J.

PAPER: "Planning and Scheduling in the Wire Mill" — by Harold L. Komeski, Supt., Planning & Scheduling, Wire Mills, John A. Roebling's Sons Div., The Colorado Fuel & Iron Corp., Trenton, N. J.

PAPER: "Cold Extrusion: A Market for Rod and Wire" — by Ross W. Perry, Mgr., Cold Forming Div., Parker Rust Proof Co., Detroit, Mich.

PAPER: "The Cold Extrusion of Wire" — by Alfred Braun, Braun Engineering Co., Detroit, Mich.

2:00 P.M., TUESDAY, NOV. 15

MODERATOR

Elmer N. Johnson, Met., Republic Steel Corp., Chicago, Ill.

PAPER: "What is Meant by 'Straight Wire'" — by Sumner H. Hawley, Chief Eng., The Lewis Machine Co., Cleveland, Ohio

PAPER: "A New Design for Manufacturing Welded Wire Fabrics" — by Cecil J. Kinsey, Asst. to Chief Eng., Southern Dist., Republic Steel Corp., Gadsden, Ala.

PAPER: "Stationary Block Drawing and Handling of Wire" — by Richard K. Weyant, Pres., Enterprise Wire Co., Blue Island, Ill.

PAPER: "Cold Heading and Cold Extrusion of Wire" — by John C. McMurray, Res. Asst. to the Pres., Waterbury Farrel Fdry. & Mach. Co., Div. of Textron, Inc., Waterbury, Conn.

MOTION PICTURE: "Parts from Wire" — Courtesy of National Machinery Co., Tiffin, Ohio

FERROUS DIVISION TECHNICAL SESSIONS (Cont'd.)

9:00 A.M., WEDNESDAY, NOV. 16

MODERATOR

E. Gordon Baker, Chf. Wire Met., The Steel Company of Canada Ltd., Hamilton, Ont., Canada

PAPER: "Sintered Tungsten Carbide Dies in the Wire Industry" — by Edgar T. Miller, Mgr., Wire Die Sales, Firth Sterling, Inc., Pittsburgh, Pa.

PAPER: "Mechanical Descaling Process in France" — by Bernard Labbe, Dir. Genl., Societe Metallurgique de Gorcy, Gorcy, France.

PAPER: "An Economic Analysis of Acid Pickling vs. Multiple Strand Blast Cleaning of Wire Rods" — by Gilbert D. Dill, Consultant on Blast Cleaning & Material Handling, Mishawaka, Ind.

PAPER: "The Challenge of Spent Acid" — by John E. Kinney, Sanitary Engineering Consultant, Ann Arbor, Mich.

NON-FERROUS DIVISION TECHNICAL SESSIONS

Bare Wire Section

9:00 A.M., TUESDAY, NOV. 15

MODERATOR

Bruce W. Gonser, Technical Dir., Battelle Memorial Institute, Columbus, Ohio

PAPER: "Some Factors Influencing the Performance of Non-Ferrous Wire Drawing Lubricants" — by Dr. Robert C. Williams, Vice Pres., Chg. of Research, The Ironsides Co., Columbus, Ohio

PAPER: "Controlled Distortion of Wire and Its Effect on Coil Packaging" — by Joseph J. Kovaleski, Pres., Advanced Wyrepak Co., Bridgeport, Conn.

PAPER: "Modern Developments in the Control of High Speed Low Tension Reeling Equipment" — by James L. Entwistle, Sr., Pres., Enjaco Corp., Cranston, R. I.

PAPER: "Carbon Block Brazing of Stranded and Solid Copper Wire" — by Maurice G. Steele, Prop., M. G. Steele Co., Rome, N. Y.

2:00 P.M., TUESDAY, NOV. 15

MODERATOR

James R. Howell, Supvr., Product Eng., Wire Plant, Sylvania Electric Products, Inc., Warren, Pa.

PAPER: "Degassed Nickel and Nickel Alloys for the Electron Tube Industry" — by Richard P. Waugh, Met. Eng., Sylvania Electric Products, Inc., Warren, Pa.

PAPER: "The Diamond Mine in Your Die Room" — by Jack Wiziarde, Diamond Product Sales Mgr., Elgin National Watch Co., Elgin, Ill.

PAPER: "Fabrication of Beryllium Wire" — by A. G. Gross, Jr., Staff Eng., Res. & Devel. Dept., The Brush Beryllium Co., Cleveland, Ohio

PAPER: "Properties and Applications of Some Specialty Wires" — by Donald E. Thomas, Manager of Engineering, Hudson Wire Co., Ossining, N. Y.

9:00 A.M., WEDNESDAY, NOV. 16

MODERATOR

Tom Y. Henry, Div. Mgr., Flexo Wire Div., Copperweld Steel Co., Oswego, N. Y.

PAPER: "Copper Rod & Wire Mill Scrap and Losses" — by John A. Bell, Eng., Western Electric Co., Hawthorne Works, Chicago, Ill.

PAPER: "Some Observations on Pressure of Copper Alloy Extrusions" — by Earle W. Lovering, Div. of Devel. Engineering, Scovill Manufacturing Co., Waterbury, Conn.

PAPER: "Some Notes on Heat Treating Wire and the Equipment Therefor" — by W. A. Darrah, Vice Pres., Lindberg Industrial Div., Lindberg Engineering Co., Chicago, Ill.

ELECTRIC WIRE & CABLE TECHNICAL SESSIONS

Non-Ferrous Division

9:00 A.M., TUESDAY, NOV. 15

MODERATOR

Charles M. Fredrickson, Tech. Dir., Southern Electrical Corp., Chattanooga, Tenn.

PAPER: "Vinyl Plastisol — A Versatile Material for Insulating Wire and Encapsulating Wire Harness Constructions" — by Robert C. Lawrence, Jr., Chemical Products Corp., East Providence, R. I.

PAPER: "Properties and Processing of Ethylene Copolymers for Wire and Cable" — by J. D. Vaughan and W. W. Spohn, Wire & Cable Program Group, E. I. du Pont de Nemours & Co., Wilmington, Del.

PAPER: "Effects of Environmental and Other Conditions on Dissipation Factor and Dielectric Constant of Very Low-Loss Polyethylene Compounds" — by Thomas Hazen, Devel. Associate, Union Carbide Plastics Co., Bound Brook, N. J.

PAPER: "Moisture Control in Plastics Preceding Extrusion for Wire and Cable" — by Floyd Kruger, Senior Eng., Exchange Area Cable Dept., Western Electric Co., Chicago, Ill.

2:00 P.M., TUESDAY, NOV. 15

MODERATOR

David Barr, Plant Eng., National Electric Div., H. K. Porter Co., Ambridge, Pa.

PAPER: "History of Extrusion Equipment for Rubber and Plastics" — by Victor M. Hovey, Sales Engineer, John Royle & Sons, Paterson, N. J.

PAPER: "Vertical CV" — by Philip C. Greene, Div. Mgr., Davis-Standard Div., Franklin Research Corp., Mystic, Conn.

PAPER: "Vector CV — Continuous Vulcanization of High Voltage Cable in a Catenary Tube" — by Harold H. Ramsey, Mech. Eng., and John C. Ramsey, Eng., John Royle & Sons, Paterson, N. J.

PAPER: "Synchronized Extruder — Capstan Drives for High Speed Insulating Lines" — by H. L. Kelley, Mgr., Adjusto Spede Sales, and A. W. Harrington, Chief Appl. Eng., The Louis Allis Co., Milwaukee, Wis.

PAPER: "Color Applications in the Wire and Cable Industry" — by Sumner H. Levin, Tech. Dir., The Blane Corp., Canton, Mass.

9:00 A.M., WEDNESDAY, NOV. 16

MODERATOR

Marshall V. Yokelson, Chief Met., General Cable Corp., Bayonne, N. J.

PAPER: "Production of Aluminum Redraw Rod by the Southern Electrical Corporation" — by T. E. Colston, Met., and Charles M. Fredrickson, Tech. Dir., Southern Electrical Corp., Chattanooga, Tenn.

PAPER: "Aluminum Sheath for Cables by Direct Extrusion" — by F. F. Polizzano, Research Met., Research Laboratory, General Cable Corp., Bayonne, N. J.

PAPER: "The Application of Enamel Coverings to Rectangular Copper Sections and Their Specialized Application in the Manufacture of Continuously Transposed Conductors" — by J. Cowen, Divisional Chief Eng., Winding Wire Div., British Insulated Callender's Cables Ltd., Melling, England.

PAPER: "Tinsel Conductor Manufacture" — by H. L. Wessel, Dept. Chief, Cord & Special Processes Dept., Western Electric Co., Baltimore, Md.

OTHER CONVENTION ACTIVITIES

WEDNESDAY AFTERNOON, NOV. 16

2:00 P.M. — Meeting of the Electric Wire & Cable Management Committee

4:00 P.M. — The Annual Business Meeting of The Wire Association. This is a meeting for Association Members. All members are requested and urged to attend this meeting for the transaction of business, where they will have an opportunity to learn of plans for the coming year, to offer suggestions for the improvement of services and to participate in the affairs of the Association.

OTHER CONVENTION ACTIVITIES (Cont'd.)

WEDNESDAY EVENING, NOVEMBER 16

6:00-7:00 P.M. — RECEPTION AND HOSPITALITY HOUR

7:00 P.M. — THE ANNUAL BANQUET

Following dinner the awards for the outstanding papers in 1959 will be presented to the following persons:

MEDAL AWARD (FERROUS DIVISION): To HOWARD J. GODFREY, Asst. Chief Devel. Eng., John A. Roebling's Sons Div., The Colorado Fuel & Iron Corp., for his paper: "High Temperature Tests on Aircraft Control Cables."

MEDAL AWARD (NON-FERROUS DIVISION): To DR. ERWIN J. SAXL, President, Tensitron, Inc., for his paper: "Tension in Wire Engineering."

CERTIFICATE OF HONORABLE MENTION (FERROUS DIVISION): To DENIS G. van de MOORTEL, Technical Chief Mgr., United Rope Works, Holland, for his paper: "New Methods for the Fatigue Tests on Steel Wires and Wire Ropes and the Viewpoints Opened by the Results Obtained."

CERTIFICATE OF HONORABLE MENTION (NON-FERROUS DIVISION): To ALEXANDER F. SPERDUTI, Asst. Chief Eng., The Fenn Manufacturing Co., for his paper: "The Rolling of Round Wire into Flats and Rectangles."

AFTER DINNER ADDRESS

The 1960 Program Commitee has been most fortunate in its selection of a speaker on a subject of great timely interest. He is Colonel JOHN SLEZAK, Director, The Institute for American Strategy; former Under Secretary of the Army; Director, Illinois Bell Telephone Company; and Chairman of the Board, Kable Printing Company. Colonel Slezak will address the gathering on "The Aspects of Our World Strategy."

9:00 A.M., THURSDAY, NOVEMBER 17

THE PLANT INSPECTION TOURS

Busses will depart from the La Salle Hotel for two plant inspection tours.

FERROUS DIVISION — Tour of Republic Steel Corporation's wire mill in the South Chicago Works.

NON-FERROUS DIVISION — Tour of Western Electric Company's Hawthorne Works. This tour will embrace the rod mill, wire drawing and stranding departments, and the company's extensive insulating operations.

Please purchase your bus tickets well in advance to assure the provision of adequate transportation facilities. All visitors must go by bus.

WEAR YOUR BADGE AND HAVE YOUR BUS TICKET WITH YOU.
BUSSES ARE EXPECTED TO BE BACK AT THE HOTEL BY 1:00 P.M.

PROGRAM FOR THE LADIES

For Wednesday Morning and Afternoon a tour of points of interest and luncheon has been arranged. Tickets may be secured at the registration desk. The ladies also are invited to attend the Hospitality Hour and Banquet.

Insofar as possible, all papers will be preprinted in the October issue of Wire and Wire Products. Others will be printed in November and December. The Convention proceedings, the Story of the Convention and the Mordica Memorial Lecture will be published in the January, 1961, issue.

The registration fee of $18.00 for members and $20.00 for non-members includes a ticket for the Annual Dinner. Please show your membership card when registering.

All those attending the Convention are invited to visit the Illinois Room on the Mezzanine Floor to see the exhibits displayed there. Open from 5:00 P.M. Sunday, Nov. 13, through 5:00 P.M. Wednesday, Nov. 16.

THE MORDICA MEMORIAL LECTURE

An invitation to deliver the Mordica Memorial Lecture is considered the highest honor within the power of the Board of Directors of The Wire Association to bestow upon a member.

The lecturer is selected each year by the Board of Past Presidents on the basis of outstanding contributions to the wire industry.

The 1960 Mordica Memorial Lecture will be delivered by DARTREY LEWIS, Chief Engineer, Research & Development, John A. Roebling's Sons Div., The Colorado Fuel & Iron Corporation, Trenton, N. J. His subject will be: "PLASTIC COATED STEEL WIRE."

THE ANNUAL MEDAL AWARDS

Every year a bronze Medal is presented to an author in each of the Association's divisions—Ferrous and Non-Ferrous—for those papers that come nearest to the requirements set forth herein. Honorable mention Certificates are also awarded. These awards are presented during the Annual Convention of The Wire Association. The medals and certificates are accompanied by cash awards of $100.00 and $50.00 respectively.

* * *

Consideration for such awards is not limited to papers presented at Association meetings, but to all papers submitted by members as a contribution to The Wire Association and published in WIRE AND WIRE PRODUCTS.

* * *

All papers submitted become the property of The Wire Association and are assigned to WIRE AND WIRE PRODUCTS for copyrighting and exclusive publication.

* * *

Awards, you will note, are a recognition of a definite contribution to the advancement of the interests of the Wire Industry.

* * *

Selection of papers for awards rests in the hands of the Association's Committee on Awards, which is headed by a director of The Wire Association.

REQUIREMENTS FOR CONSIDERATION OF PAPERS

The first consideration of eligibility is that the author or authors must be Association members. A second is that it must be a contribution to the Association or to WIRE AND WIRE PRODUCTS, as articles for which the magazine has paid an honorarium cannot be considered. A third is that any paper that has been previously presented before another society or published in another magazine cannot be taken under advisement for awards.

* * *

JUDGING PAPERS

Papers eligible for awards are judged by the Oxford System, which is considered the best one so far devised for the impersonal determination of the worthwhileness of papers. Consideration is given to the following points, among others:

1. Value of the paper to The Wire Association's members as a whole.
2. Does it contain new information that has not been published hitherto, or is it merely a restatement of research material?
3. Does it constitute an advancement in knowledge by clarification of past information?
4. Does it provide a re-assessment of known facts in such manner as to be readily understood by the industry as a whole?
5. Are the claims in the paper factually supported with definite, impartial test data and established experience?
6. Is the paper valuable as a reference work?

All members of The Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Convention or the Regional Meetings.

THE TWENTY-FIVE YEAR CERTIFICATES

These certificates of The Wire Association are presented each year by the Board of Directors to those who have been members continuously for 25 years. The 1960 recipients are:

JOSEPH C. BARTLETT, Pres.
The Bartlett Hair-Spring Co.
North Haven, Conn

WALTER D. BRONSON, Pres.
Bronson & Bratton, Inc.
Chicago, Ill.

TAYLOR CORNELIUS, Asst. Gen. Mgr.
Aluminum Company of Canada, Ltd.
Montreal, Que., Canada

EMIL DERN, Treas.
Kelly Wire Die Corp.
New York, N. Y.

GEORGE E. DONALD, Pres.
Donald Rope & Wire Cloth, Ltd.
Hamilton, Ont., Canada

JOHN H. FRIEDMAN, Chm. of Bd.
National Machine Co.
Tiffin, Ohio

WILLIAM GOULD, Pres.
Lincoln Wire Co.
New York, N. Y.

JAMES JEFFRIES, Asst. Mgr.
The Driscoll Wire Co.
Shelton, Conn.

FRANK JENKS, Mgr.
Rylands Bros. (Aust.) Pty., Ltd.
Newcastle, N.S.W., Australia

CARL E. JOHNSON, Asst. Genl. Mgr.
Bethlehem Steel Co.
Sparrows Point, Md.

EDWIN W. KRUEGER, Pres.
Krueger Steel Co.
River Grove, Ill.

WILLIAM A. LAIDLAW, Secy.-Treas.
Hamilton Wire Products, Ltd.
Hamilton, Ont., Canada

ARCHIBALD LAUDER, Consultant
Phillips Electrical Co., Ltd.
Brockville, Ont., Canada

PHILIP M. MORGAN, Pres.
Morgan Construction Co.
Worcester, Mass.

RICHARD NEUHAUS, Chm. Bd. of Dr.
Nukem Products Corp.
Buffalo, N. Y.

ARTHUR M. REEDER, Met. Eng.
Jones & Laughlin Steel Corp.
Pittsburgh, Pa.

LEROY D. SEYMOUR, Pres.
Wire Equipment Mfg. Co.
Trenton, N. J.

VAN DORN C. SMITH, Sales Dept.
Oakite Products, Inc.
New York, N. Y.

RODMAN R. TATNALL, Prod. Eng.
Wickwire-Spencer Steel Div.
The Colorado Fuel & Iron Corp.
Buffalo, N. Y.

CHESTER F. WICKWIRE, Pres.
Wickwire Brothers, Inc.
Cortland, N. Y.

ROBERT C. WILLIAMS, V.P.-Res.
The Ironsides Co.
Columbus, Ohio

THE ELECTRIC WIRE & CABLE SECTION

of

THE WIRE ASSOCIATION

The committee, appointed by the Association's Board of Directors, the Electric Wire and Cable Management Committee, extends to all persons interested in and concerned with the production of insulated wire and cable a cordial invitation to join with them in promoting the progress of this branch of the wire industry. This Management Committee presently is comprised of:

CHAIRMAN

Clement C. Lawson, Plant Facilities Eng.
Bell Telephone Laboratories, Inc.
Murray Hill, N. J.

MEMBERS

Harold W. Adams, Director
Electrical Conductor Products
Reynolds Metals Co.
6601 West Broad St.
Richmond, Va.

David Barr, Plant Eng.
National Electric Div.
H. K. Porter Co.
338 14th Street
Ambridge, Pa.

Grover W. Brown, Mgr.
Machinery Devel.
The Okonite Co.
Passaic, N. J.

Charles M. Fredrickson, Technical Dir.
Southern Electrical Corp.
P. O. Box 989, Chattanooga, Tenn.

Alfred Garshick, Devel. Eng.
Boston Insulated Wire Co.
65 Bay St., Boston 25, Mass.

James S. Higgins, Plant Eng.
Copper Div.
Walker Brothers
Conshohocken, Pa.

R. W. Higginbottom, Chief Cable Eng.
Triangle Conduit & Cable Co.
P. O. Box 711
New Brunswick, N. J.

Alexander A. Kerr, Supt., Prodn.
Electrical Wire Div.
John A. Roebling's Sons Corp.
Trenton 2, N. J.

C. L. Kessler, Chief Works Met.
Aluminum Company of America
P. O. Box 150, Massena, N. Y.

Urbain J. H. Malo, Technical Dir.
Narragansett Wire Co.
1102 Main St.
Pawtucket, R. I.

Glen J. Moher, Process Eng.
Canadian General Electric Co. Ltd.
107 Park St., Peterboro, Canada

W. R. Moyers, Chief Eng.
Wire Engineering Dept.
Western Electric Co.
P. O. Station B
Buffalo 7, N. Y.

J. C. Murray, Jr., Vice-President
Crescent Insulated Wire & Cable Co.
319 N. Olden Ave.
Trenton 5, N. J.

Sidney Rolle, Cons. Met. Eng.
32 Snowden Lane
Princeton, N. J.

David M. Schmid, President
Techalloy Co., Inc.
Rahns, Pa.

Benoit J. Sirois, Met. Eng.
Phelps Dodge Copper Products Co.
Bayway & Front Sts.
Elizabeth, N. J.

H. S. Spaulding, Technical Supt.
Kaiser Aluminum & Chemical Corp.
P. O. Box 671, Newark, Ohio

Roger T. Stafford, Project Engineer
Kennecott Wire & Cable Co.
Phillipsdale (Rumford 16), R. I.

J. E. Thomas, Mgr., Brockville Div.
Phillips Electrical Co., Ltd.
Brockville, Ont., Canada

Marshall V. Yokelson, Chf. Met.
General Cable Corp.
Bayonne, N. J.

The committee arranges for papers for regional meetings and the Annual Convention, reviews them to see that they are desirable as to subject matter and quality, and formulates policies that will promote the best interests of insulated wire production personnel. Recent authorization to increase the membership to twenty-five will be implemented by further appointments in the near future.

You are invited to send for a booklet describing the activities of The Wire Association and a membership application card.

THE WIRE ASSOCIATION

RICHARD E. BROWN, EXECUTIVE SECRETARY

453 Main St. **Stamford, Conn.**

LARIBEE WIRE *Is Making News!*

RUMOR HAS IT . . .

That Mohawk Copper Company, Inc., bought our Company
That we bought aggressive new management, and
NOW Everybody's buying our wire

QUALITY

plus

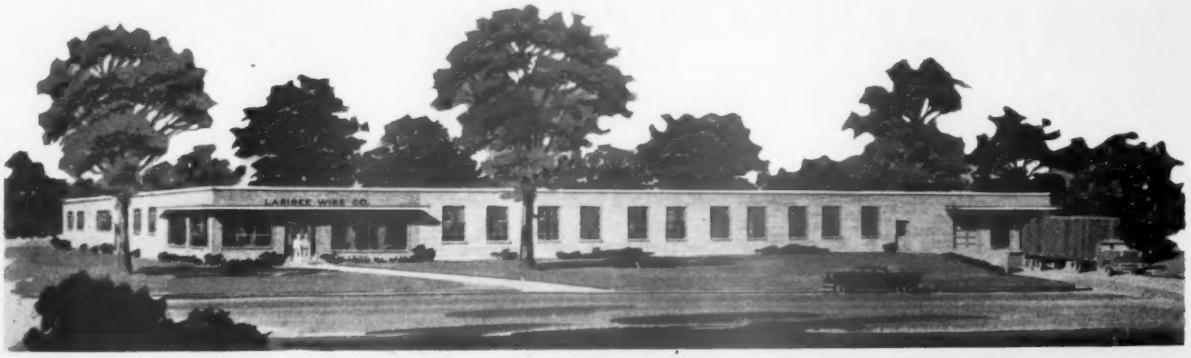
DEPENDABILITY

. . . IT'S ALL TRUE. WHY?

For flawless extrusion, our quality controls permit us to meet precision tolerances and guarantee to you a wire of constant diameter and tensile strength. **AND** what's just as important to you, our order service department will get your wire to you when and as you need it.

FABRICATORS OF THE FINEST COPPER WIRE AVAILABLE

Solids . . . Stranded . . . Braid . . . Bunched . . . Cables . . . All bare or tinned



LARIBEE WIRE & EQUIPMENT CORP.

120 WALL STREET
New York, 5
WHitehall 4-0215

CAMDEN
New York
CAmden 42

NEW! WYREPAK SPOOLING and PACKAGING EQUIPMENT

A complete NEW line of spooling and packaging equipment has been designed, engineered and built with your wire production interests in mind. The outstanding and remarkable advantages of the new line are set forth below.

WYREPAK Packaging Machine Specifications

MODEL S5-TC-S COMBINATION

1. Maximum Speed: Up to 150 ft. per min.
2. Capacity of Containers: 5 gallons
   a. Minimum wire size: No. 32
   b. Maximum wire size: No. 20
   c. Nominal weights: 100 lbs.
3. Specifications for spools (60 lbs. max.)
   a. Maximum traverse: 9 inches
   b. Minimum traverse: 3 inches
   c. Maximum spool flange: 12 inches
   d. Maximum wire size: No. 15
   e. Minimum wire size: No. 38

MODEL TENSION MASTER 150 (for spools only)

1. Maximum Speed: Up to 150 ft. per min.
2. Specifications
   a. Maximum traverse: 13 inches
   b. Minimum traverse: 3 inches
   c. Maximum spool: 12 in. flange diam.
   d. Maximum wire size: No. 15
   e. Minimum wire size: No. 38
   f. Maximum weight, spool: 120 lbs.

MODEL TENSION MASTER 600 for TINNED WIRE

1. Maximum Speed: Up to 600 ft. per min.
2. Operates at constant feet per minute.
3. Specifications
   a. Maximum traverse: 13 inches
   b. Minimum traverse: 3 inches
   c. Maximum spool: 12 inch flange diam.
   d. Maximum wire size: No. 15
   e. Minimum wire size: No. 38
   f. Maximum weight, spool: 120 lbs.

By adding the WYREPAK Spooler to the original WYREPAK packaging machine, you now have greater flexibility, larger packages on spools or reels with the greater advantage of being able to handle much finer wire.

Take-ups for other wire sizes and reels according to your requirements.

Full details supplied on request. Watch future WYREPAK advertising for descriptions of each individual machine. This is important to you as a wire producer as WYREPAK builds for the FUTURE only.

Advanced Wyrepak Co., Inc.

11 HARRISON COURT PHONE: EDison 4-4274 BRIDGEPORT, CONN.
OR The Vaughn Machinery Co., CUYAHOGA FALLS, OHIO

In this department will be published helpful hints on how to do things and the questions asked by our readers on wire processing problems, together with the answers and comments thereon received from the field. In no instance will the identity of the persons asking for advice or of those supplying it be published.

Our readers are invited to send helpful contributions and to submit questions on their technical problems to the Editor. These will be answered from information on hand or from the field, when it becomes necessary to secure counsel from that source.

Spooling Alloy Resistance Wires

QUESTION

I have a problem in my department concerning the spooling of alloy resistance wires. The nominal composition of several alloys follows:

	Alloy A	Alloy B	Alloy C
%Cu	55	Bal	Bal
%Ni	Bal	4	23
%Mn		12	

* * *

These alloys are all copper base and are considered "soft alloys." The wire enters the department on 10 to 25 lb. supply spools from the heat treating department and is in the fully annealed condition. The size of the wire ranges from .004 in. to .025 in. dia. and is drawn and sold to resistance specifications.

* * *

The hard drawn wire is continuously "brite" annealed in a dry hydrogen (reducing) atmosphere and spooled onto the supply spools mentioned above.

* * *

My department is responsible for the quality of the final spooling of the wire onto spools of various sizes and weight tolerances to conform to customer specifications. The precision package (spool) must satisfy the customers who take the wire off the spools at high speeds when manufacturing precision resistors, potentiometers, braiding, weaving, etc.

* * *

The basic problem is to spool this alloy wire onto the spool and make sure the wire remains tight. If insufficient tension on the wire is used during spooling the wire will inevitably be loose on the spool. But, if excess tension is used then the wire will yield (or "stretch") which results in a decrease in diameter and the resistance requirements cannot be met.

* * *

Time and time again I have produced a good spooling job with these alloy wires and have observed the wire actually "loosening up" on the spool. Many various lay and pitch vibrations have been tried with the same results. The problem is apparently of metallurgical nature and must be solved.

* * *

Many other alloys are spooled using the same equipment and techniques and remain tight on the spool. Most of these are the standard grades of stainless steel and Nickel-chromium alloy wires.

* * *

I am sure that the copper wire industry must have methods for spooling wire tight on a spool which will remain tight.

* * *

I would sincerely appreciate any help and assistance that The Wire Association can supply.

REPLY NO. 1

The problems posed in your letter seem to be mainly a matter of selecting proper winding tension.

* * *

We have experimentally annealed and spooled similar alloys and noted its rather strange behavior. After annealing with elongations in excess of 50%, the product shows a tendency to come off the spool in a perfectly straight manner rather than retain part of the spooling curvature. Quite evidently specific spooling tension must be employed in order to force the convolutions to remain on the spool, yet slight excess of permissible tension will elongate the product. To what extent constant lay or variable lay during spooling is desirable we can not tell, however, our own spoolers have the traversing mechanism connected to the spool arbor thereby obtaining equal pitch lay throughout the filling of the spool. It would be desirable to employ a spooler of the overdriven type so as not to introduce variations in wire speed during the filling of the package.

* * *

We trust that this rather meager advice will point to a solution of the problem.

REPLY NO. 2

In reply to your letter in connection with a problem of spooling copper base alloys.

* * *

I am thoroughly convinced that this problem is not a metallurgical problem. It is purely a matter of proper spooling. I am sure that it would be very easy for one of our technical men to straighten this man out, because it is a matter of using the proper equipment for spooling, which I am sure will overcome his difficulty.

* * *

If you would care to send us the name and address of this individual, I would arrange to have one of our men stop in to see him. I am sure we can straighten him out. This is not a new problem. It is a problem which exists throughout the entire industry and can be very easily licked.

For Two Pins . . .

The two brass pins, approxi-

When You DRAW Wire...Use an experienced hand

Wire Machinery Inc.

SAVE With Whitacre DEAD BLOCKS

FITS ANY INSTALLATION

FROM OLD EQUIPMENT YOU GET NEW PRODUCTION

Even outmoded drawing machines — as you see above — will give up to date production with the installation of Whitacre Wire Drawing Dead Blocks.

Remember Whitacre fits any installation.

Wire Machinery Inc.

5407 S. KNOX AVE.,
CHICAGO 32, ILL.
Phone: POrtsmouth 7-2508

Wire Kinks

mately 1" long, shown below, were brought to light by a member of the Rylands family when searching through old documents at his home.

The longer pin, probably dated 1638, and the shorter pin 1740, were found fastening together old documents. The enlarged illustration shows the detail of the pin head and the double turn of wire can be clearly seen.

* * *

For many centuries pins were imported from the Continent, but eventually after much strenuous campaigning by the Company of Pinners and Wire Drawers they were manufactured from the early seventeenth century onwards in this country. At that time pins were made in two separate parts; the head being a double turn of thin wire compressed to grip tightly on the shank. It was not until 1817 that a machine was invented for making a one-piece pin, but it was not completely successful, and a further number of years elapsed before a really practical machine was brought into use. Specimens of the old style pin occasionally come to light and can be distinguished quite easily from those of modern make; the globular head being completely different from the flat head of today's pin.

— Courtesy of "Live Wire," published by Rylands Brothers Ltd., Warrington, England.

Use For Nail Whiskers

QUESTION

Do you know anyone who uses nail whiskers in commercial applications? Ours are clean and should have more value than mere scrap.

REPLY NO. 1

Regarding uses of nail whiskers for other than scrap, some nail producers have developed markets, but are reluctant to reveal them. We suggest that the purchasing department make inquiries in the area of the mill and see what can be done. There are uses, but they have to be sought out.

REPLY NO. 2

I know of no uses other than scrap. Some years ago a shot blasting concern experimented with nail whiskers, but nothing ever came of it. They are most useful to us when we need a light change of scrap after an electric furnace has been charged, as they bring the charge up to weight and trickle down through the charge evenly.

REPLY NO. 3

Nail whiskers have been used for cleaning castings, sand blasting buildings, etc., but we use them principally in charging our furnaces, as the price we get for other uses does not warrant storage and handling costs.

Hot Wire Drawing Block

QUESTION

We read in your journal, in a description of a new rod mill, the following:

> **"A 26" Hot Wire Drawing Block is installed with infinitely variable speed between 50 and 200 feet per minute. *High Speed Steel Wire is heated through a lead graphite bath, baking oven, and lead bath furnace.*"**

* * *

We would appreciate any additional details that you can furnish regarding the process, especially those concerning the hot block, which I have underscored.

ANSWER

1. The wire or rod is generally run on an "in-line" plant, the first stage being a dip in an aqueous graphite solution at room temperature. This coating has a two-fold purpose in that it prevents "pick up" of lead during heating and also acts as a drawing lubricant.

2. The wire is then baked in an air circulating oven to dry the graphite coat before passing into a lead bath.

3. The wire is heated in a lead bath to 450-500°C, depending on the quality of the material being drawn.

4. The wire or rod is then drawn through a tungsten carbide die and coiled in the normal way on the block. As far as we know the only lubricant used in this type of work

(*Please turn to page* 1453)

New Government Publication On Shipping

Publication of a General Services Administration handbook for use by Federal agencies to minimize damage to shipments of Government property has been announced. The 44-page booklet "Loss and Damage" highlights some of the more practical methods of preparing goods for shipment and arranging for their safe transportation.

* * *

The booklet points out that the responsibility for the prevention of loss and damage to Government freight is not solely that of the freight-traffic manager, but is shared by the packers, freight handlers, truck drivers, and delivery and receiving clerks, as well as the warehouse or terminal managers. "Loss and Damage" is directed to each member of the team engaged in moving Government property from point to point.

* * *

The manual prepared by GSA's Transportation and Public Utilities Service is third in a series that includes "Common Shipping Faults" and "How to Prepare and Process U. S. Government Bills of Lading."

* * *

"Loss and Damage" is being distributed to Federal agencies and will be available to the public through the Government Printing Office, Superintendent of Documents, Washington 25, D. C., for 35 cents a copy.

Simplex and Hitemp Plan Merger

Directors of **Simplex Wire & Cable Co.**, Cambridge, Mass., and **Hitemp Wires, Inc.** of Westbury, Long Island, have approved a plan to merge Hitemp into Simplex.

* * *

The merger plan, to be submitted for approval to stockholders of both companies, provides for an exchange of one share of Simplex stock for two shares of Hitemp.

* * *

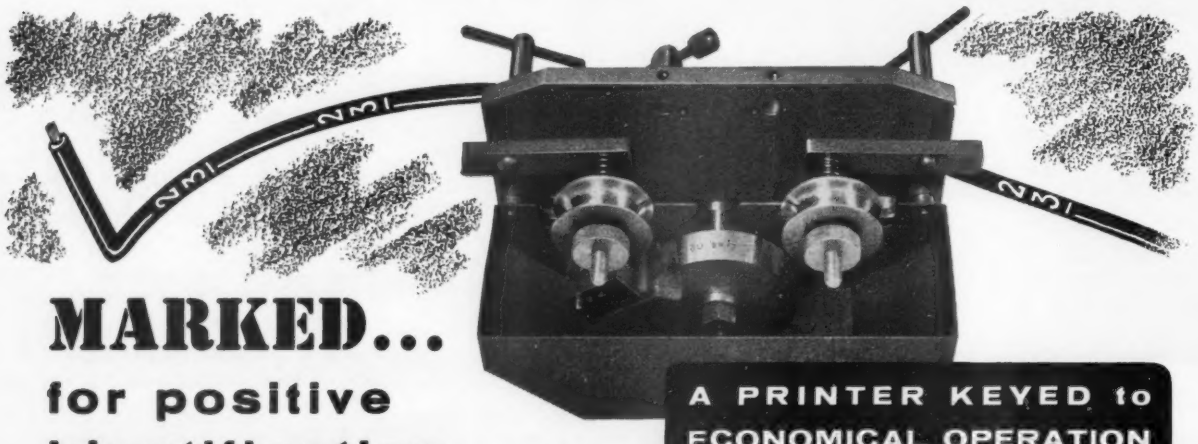
Simplex Wire & Cable Co. has been a prominent manufacturer of high quality insulated wires and cables for power transmission, communication, control and signaling purposes since 1885. Its main plant is in Cambridge, Mass., with a Submarine Cable Division in Newington, N. H. It employs about 1,500.

* * *

Hitemp Wires, Inc., organized in 1951, manufactures insulated wires and cables for high temperatures. Its products are used primarily in guided missiles, electronics and business machines. It has plants in Westbury, Long Island, and Monrovia, Calif., and employs about 300.

* * *

After the merger, Hitemp will operate as The Hitemp Co., a division of Simplex. The merger will enable Simplex to broaden its line of products and to participate in a section of the wire and cable industry which in recent years has expanded rapidly.



MARKED...
for positive identification

A PRINTER KEYED to ECONOMICAL OPERATION

Now . . . the Gillies Single Printer — prints large, clear, legible letters and numbers or IPCEA color code on one side of insulated wire, plastic, neoprene or rubber hose and tubing. A machine easily positioned in a wire line.

Uses standard flat or the engraved Gillies Concave marking wheels. Concave wheels allow the use of much larger print than flat wheels and make perfect guides for wire. Simplicity of design for rapid cleaning. Wheels of any width may be used on the Gillies Single Printer, Model GS-100. Adjustable guide wheels have vernier control for precision adjustment.

GS-100 for standard wire
GS-100 HD for heavy wire (Heavy Duty)
GS-200 A Prints both sides at once

SEND FOR SAMPLES OF WIRE IMPRINTED WITH GS-100, GS-100 HD OR GS-200 A

PRICES ON REQUEST

DUNCAN M. GILLIES CO., INC.
P. O. BOX 181 · WEST BOYLSTON, MASS.
TELEPHONE TE 5-4445

New 50 KV DC HV Test Set

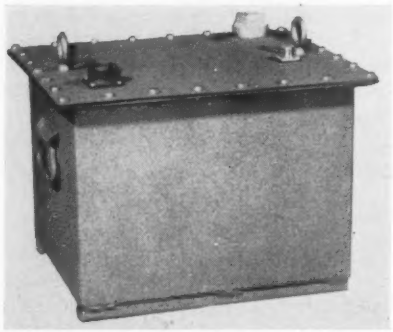
Featuring small size, light weight, and maximum ruggedness with low cost, Model S50-5DC produces 5 ma continuously at 50 KV.

* * *

The oil-fill high-voltage tank weighs 90 lbs with oil, and measures less than 1 cubic foot in volume. It contains all HV components including metering facilities and an automatic output shorting switch — a gravity type solenoid — to insure automatic discharge of capacitor on completion of test.

* * *

Selenium rectifiers are used for



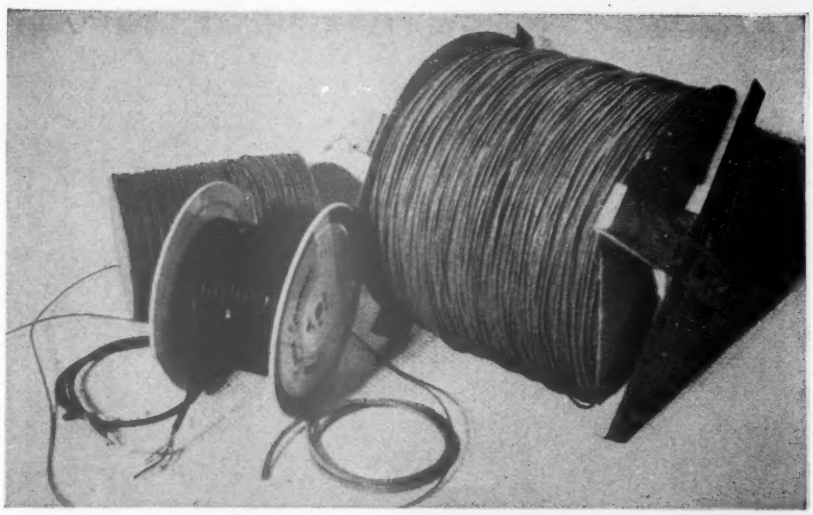
ruggedness, long life, and enhanced reliability. A shielded polyethylene cable is used for HV output.

* * *

A fully instrumented control panel, not shown, is mounted in a sloping-front table top cabinet, or may be rack mounted. The control cabinet provides for dual-scale metering of both load current and output voltage, continuously adjustable output control from zero to 50 KV DC, a zero start interlock with optional bypass switch on the powerstat output control, switches with pilot lights for input power and high-voltage, fuses, HV on and HV off push buttons with lock-in contactor, and a selector switch for either straight ground or guarded return. A fault relay deenergized the high-voltage at the maximum capacity of the test set.

* * *

Designed for dielectric testing, and for leakage current measurements at high voltage, it is also used as a high-voltage power supply where up to 5 ma at 50 KV is



For High Tensile Strength, Specify

TEXTILENE GLASCOR*

Soft, dry fillers for portable and flexible cords, Textilene Glascor and Twi-Port have wide acceptance. Fiberglas-centered Glascor is exceptionally strong without added bulk or sacrifice of pliability. It goes into S, SJ, and SV cords with 18, 16, and 14 gauge conductors — Twi-Port into S and SJ cords with 12 gauge and larger conductors. Successful applications include control, appliance, and power cables; telephone drop wire; communications and coaxial cables.

Twitchell's superior Textilene line also includes: Fungus-resistant filler — *Twi-Tar*. Used for buried communications cable, expanded ACSR cable, and in other applications.

Moisture-resistant fillers—*Twi-Flex* and *Twi-Wax*. Used for nonmetallic sheathed cable, maritime shipboard cable, varnished cambric cable.

*Patent No. 2832190

For Every Wire and Cable Application
Twitchell's TEXTILENE Fillers Fill The Bill

Quality-controlled materials that are dependably uniform . . . in standard forms, or customized to special needs.

Assured supply from a reliable domestic source . . . always available in economical and convenient packaging.

Initial low cost with savings added by production efficiency . . . flexible, ready-to-use fillers that fit all equipment, handle and form easily, always maintain desired shape.

Proved performance as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

FREE — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation—also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

E.W. TWITCHELL INC.

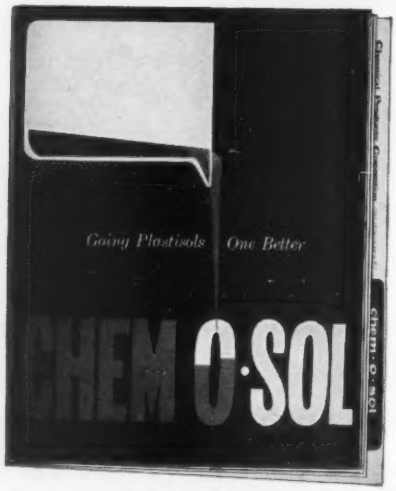
Third and Somerset Streets, Philadelphia 33, Pa. • REgent 9-7800

PAPER PRODUCTS FOR THE WIRE INDUSTRY

Twisted • Folded • Pressed • Crushed • Shaped • Braided • Woven

NOW!

FROM PLASTISOL HEADQUARTERS



FACTS YOU NEED TO KNOW

about plastisols

This brochure brings you up-to-date on plastisols. A new edition of the definitive work in the field of polyvinyl dispersions, *"Going Plastisols One Better—* **chem-o-sol***"*, answers such questions as these:

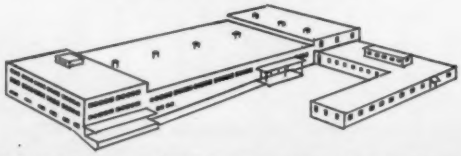
- **What are plastisols?**
- **How are plastisols applied?**
- **How can we use plastisols?**
- **How have plastisols cut assembly costs?**
- **What important properties of plastisols make them useful to industry?**
- **What future uses for plastisols can be anticipated now?**

The booklet shows many ways of improving a product with **chem-o-sol** . . . how to simplify production . . . why Chemical Products Corporation, with its pioneering experience in plastisols, its vast facilities for research and production, is your best source of supply.

Get the full story on this versatile coating and molding material for industry. For your free copy of the new **chem-o-sol** brochure, circle the reply card or write Chemical Products Corporation, Dept. MA-3, East Providence, R. I.

Going Plastisols One Better

chem·o·sol



WORLD'S LARGEST PLANT OF ITS KIND

required. It may be operated from any lighting circuit of 115 VAC, 60 cycle, single phase.

* * *

For complete details, write Pechel Electronics, Inc., Towners, Patterson, N. Y.

Thompson to Represent Miller on Coast

The R. H. Miller Co., Inc., has announced the appointment of **Thompson Associates** of Palos Verdes Estates, California, to represent their company for the sale of "Copperskin" Metal-Working Lubricants for the non-ferrous industry on the West Coast.

* * *

"Copperskin" for the drawing of copper and its alloys joins the well known names of R. H. Miller's "Steelskin" and "Redskin."

Dow Plans Polyethylene Plant in Japan

A proposal has been placed before the Japanese government by **Asahi-Dow Limited,** an associated company of **The Dow Chemical Company,** for the construction of a polyethylene plant at Kawasaki, Japan.

* * *

According to the proposal, the new plant would use the high pressure polyethylene process developed by A.G. Fur Olefin-polymerisation (AGFO process).

* * *

The principal licensor of the AGFO process, Scientific Design Company, Inc., New York, N. Y., concluded recently a contract authorizing Dow's Swiss subsidiary, **Dow Chemie A. G.,** to use the AGFO process for high pressure polyethylene in several countries on a non-exclusive basis for the benefit of its manufacturing subsidiaries and associated companies. For Japan, however, Scientific Design agreed that the license be granted exclusively to Asahi-Dow.

Polyethylene Prices Reduced

Union Carbide Plastics Company has reduced its prices on low-density polyethylene. Reductions range up to five cents per pound

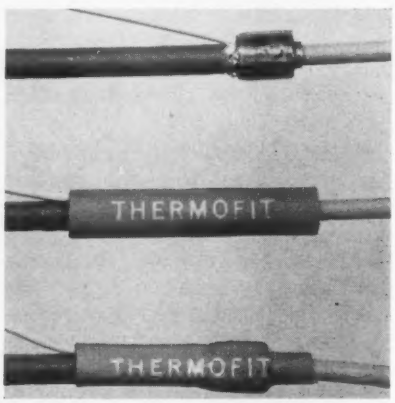
and apply to practically all types of "Bakelite" brand low-density polyethylene resins and compounds made therefrom.

* * *

In making the announcement, **R. K. Turner,** President, said that the action was being taken as part of the company's long-range marketing plan to broaden the use of polyethylene. Since 1943, the price of polyethylene resin has been reduced over 70 per cent, while at the same time the physical qualities and performance have been materially improved.

New Sleeving Shrinks to Fit

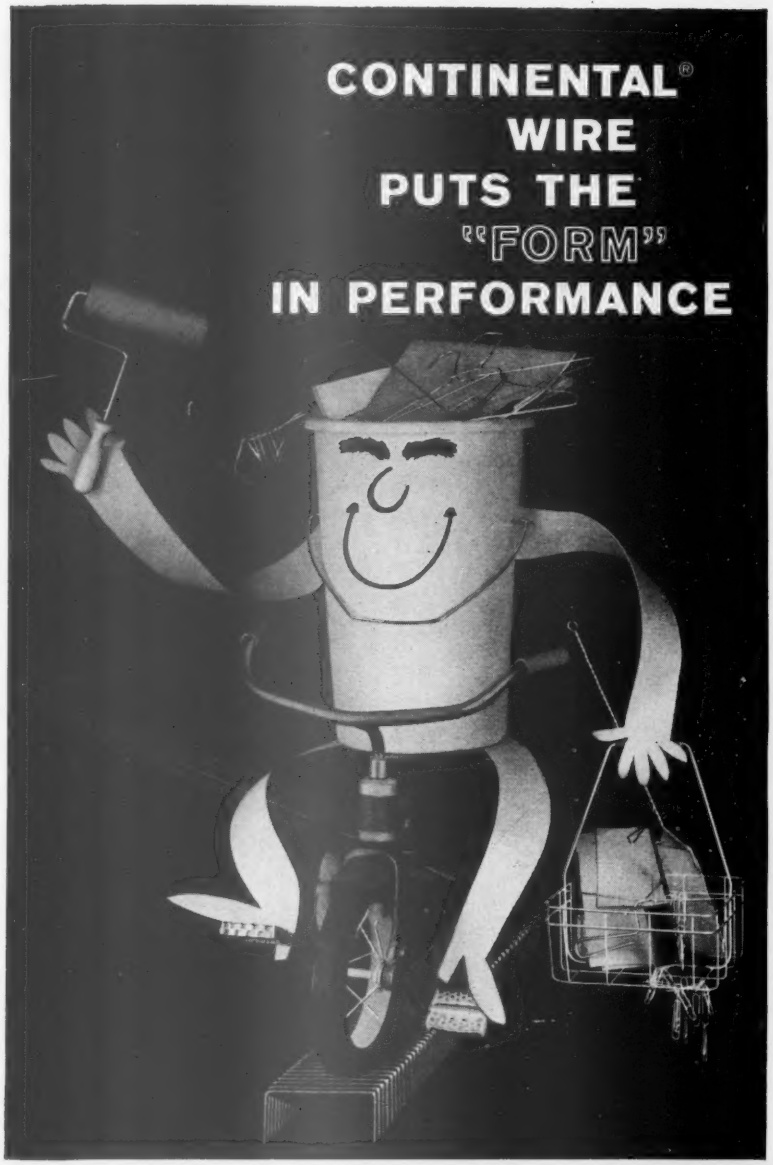
Raychem Corp., Oakside at Northside, Redwood City, Calif., has announced Thermofit, a new irradiated insulation sleeving which shrinks to a permanent specified size when exposed to heat. It is supplied with an expanded diameter for easy slip-on application



over connectors, splices or harness bundles. Heat at 235°F or above for 3-to-5 seconds activitates its "memory" characteristic, allowing the material to return to the precise diameter determined before it was expanded. In shrinking it pulls down tightly over complex contours, providing a high-performance electrical and mechanical covering.

* * *

Properties of Thermofit, which is self-extinguishing and thermally stabilized, include: no melting on cold flow; minus 100°F without brittleness; corrosion resistance to acids, alkalis, aviation fuels and hydraulic fluids; inert to fungus; high abrasion resistance; dielectric strength of 800 vpm of wall thick-



Formability that permits difficult twists and bends . . . sustained fast production in coil after coil . . . smooth tight coatings that do not powder, flake or peel to jam machines. Such wire calls for consistent, uniform quality. You can get it at Continental, in sizes and finishes to meet most specifications—from 7/16" on down to 40 gauge, in various tempers and analyses, in low and medium low carbon steels. Special shapes, too. Why not let our mill technicians work with you on any problems you may have pertaining to wire fabrication. We may have the answer to a particular need. Write today for your FREE copy of our new wire manual.

Wire Specialists for over half a century

CONTINENTAL STEEL
CORPORATION KOKOMO, INDIANA

PRODUCERS OF Manufacturer's Wire in many sizes, tempers, and finishes, including Galvanized, KOKOTE, Flame Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright and special shaped wire. Also Welded Wire Reinforcing and Galvanized Fabric, Nails, Continental Chain Link Fence, and other products

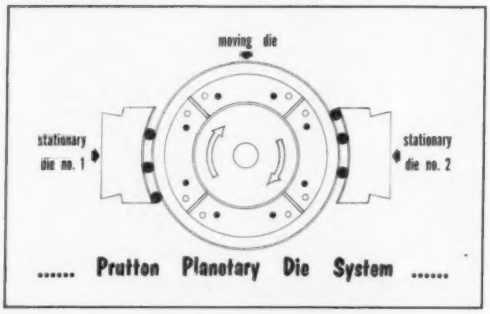
PRUTTON PLANETARY THREAD ROLLING

...produces up to 48,000 pieces per hour!

HERE'S HOW—

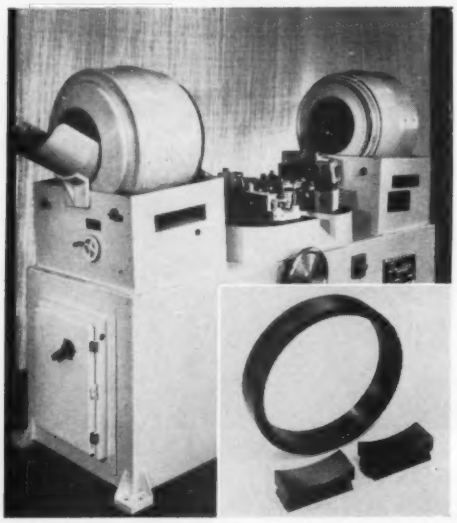
The Prutton Rollmaster takes advantage of a better application of thread rolling principles used in all production thread rolling. An important departure is in the rigidity of the thread rolling dies. Deflection or "spring" is eliminated. Note that a 300 pound forging spindle is supported by two Timken tapered bearings rated at 8 times maximum load.

A set of Prutton RTH Thin-wall Ring Dies consists of a one-piece rotary die and two stationary die shoes. The single round moving die serves both stationary dies simultaneously. Prutton's Exclusive Taper-Lock Die Holder locks the round ring firmly in position with the same action as a chuck on a lathe. It is possible to true up the die to .001 T.I.R. in 10 minutes.



..... Prutton Planetary Die System .....

ELIMINATE "Lost Motion" ON YOUR WORK . . .



Prutton Planetary Thread Rolling Machine
Model 125A-24

On a conventional machine only a single blank is rolled with each forward stroke of the moving die. The return stroke accomplishes nothing except to return the empty die to its starting position.

Compared to the old method of making only a single part at a time, a Prutton machine can produce as many as eight threaded parts per cycle. The rotary die is mounted on a main spindle of the machine and the stationary dies are diametrically opposed across the center of the moving die. A cycle is completed each time the moving die completes a 360 degree rotation. There is no lost motion. The number of threaded parts engaged by the die at one time is limited only by the number of starts on the dies. That is how speeds of 600 to 800 pieces per minute are possible with a Prutton Planetary Thread Rolling Machine. These remarkably efficient machines can cut cost as much as 65%. One Prutton can turn out as much work as 4 conventional machines.

The Prutton Planetary Die Principle can be used with equal effectiveness for thread rolling, knurling, marking, serrating and necking of bolts, screws, nails and special parts in a wide range of sizes.

Write or Phone for Cost Saving Information TODAY!

Prutton
CORPORATION
5295 WEST 130th STREET
CLEVELAND 30, OHIO

Leader in Planetary Thread Rolling

JUST PIN THIS COUPON TO YOUR LETTERHEAD

PRUTTON CORPORATION
5205 W. 130th Street
Cleveland 30, Ohio
Dept. WP

Please send information on Model 125A-24 Thread Rolling Machine.

Name ..... Title .....
Company .....
Street Address .....
City ..... Zone ..... State .....

ness; 1.28 specific gravity. It is supplied in five standard colors in 4-foot lengths (any length or color on special order). It can be marked for coding and identification. Standard I.D. sizes after shrinking range from .027 to 2.070 inches. Complete specifications and test reports available.

Kramer Buys Zinc Firm

Howard K. Chapman, president of **H. Kramer & Co.** has announced the purchase of **Aetna Metals Co.,** of Los Angeles, a producer of slab zinc, notch bar zinc and brighteners, which will be merged into the operations of Kramer's California Division in El Segundo, California.

* * *

The California Division began the sale and distribution of zinc and zinc products on August 1, 1960. Production of zinc will be maintained at Aetna's plant in Los Angeles until such time as Kramer completes the construction of a new and modern zinc plant at its present location, which will be in full operation by the end of 1960.

* * *

H. Kramer & Co., one of the largest producers of brass and bronze ingot in the United States, has its main plant in Chicago with manufacturing facilities in California and Philadelphia (Ajax Metal Division). The company, organized in 1888, and its affiliates, are the oldest continuous producers of brass and bronze ingot in the nation.

Continuous Casting of Aluminum Billets

A large and modern Billet Casting Machine recently went into production at the California plant of **Michael Flynn Mfg. Company.** Coordinated with an expansion of the extrusion plant, the casting shop features the latest and most advanced designs in melting and casting equipment.

* * *

Heart of the new casting plant is a continuous D.C. casting machine supplied by **Lobeck Casting Processes, Inc.,** 114 E. 32nd St., New York 16, N. Y., and believed to be one of the largest machines of this type to be found anywhere.

The machine, almost completely automatic, simultaneously casts 24 billets of 6 in. diameter and 20 ft. length, with production of over 20,000 lbs. of billets per hour. Manpower requirements are greatly minimized. From a metallurgical point of view, the cast billets are of superior surface quality and internal structure.

* * *

The Flynn firm specializes in producing Curtain Walls, Prime Windows, Sliding Doors, Extruded Shapes, Structurals and Tubing.

Elgiloy Capacity Enlarged

The Elgiloy Department of the **Elgin National Watch Company's Abrasives Division** has announced the enlargement of its coil spring capacity with the addition of new precision spring coiling equipment.

* * *

The primary material is Elgiloy, a cobalt base alloy developed by Elgin. Its properties include high strength and resistance to fatigue, set, corrosion and temperature. It is non-magnetic.

* * *

In addition to Elgiloy spring fabrication, Elgin will supply springs of many and varied materials, concentrating on the fabrication of super alloys to fill an increasing number of requests.

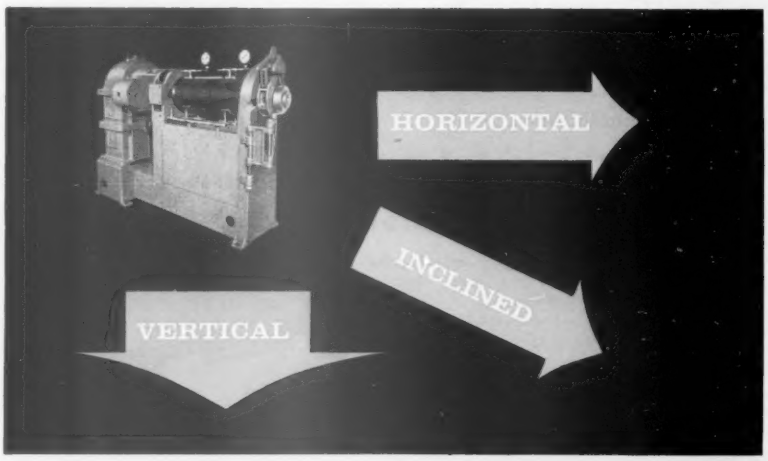
Silver-Plated, Nickel-Plated Conductors

Silver-plated, nickel-plated, copper conductors with the high temperature protection of a nickel coat, and the excellent solderability of silver, are now available. **Hudson Wire Company's Ossining Division** is offering the new double-plated construction in full AWG ranges of single end and stranded conductors.

* * *

Throughout the electronics industry, nickel-plated copper is replacing silver-plated copper for many applications where operating temperatures exceed 250°C. In cases where maximum solderability is required, however, the poor solderability of nickel has been a disadvantage. Hudson Wire's silver-plating process for nickel-plated

DAVIS-STANDARD
CONTINUOUS
VULCANIZING
SYSTEMS



Whatever your CV requirements — you can't afford to overlook these Davis-Standard exclusives:

- Experience — More CV systems engineered and produced than any other manufacturer of extrusion equipment (both new plant layout and integrated systems for existing plants).
- Patented Thermatic Extruders with steam/water temperature control.
- Patented Pressure Roller Feeder.
- Patented Feeder Block.
- Patented Rotative-Flo Crossheads.
- Patented Water Level Control (inclined and vertical).
- The leading supplier of proven CV Systems.

Ask Davis-Standard engineers to lay out and recommend a "MATCHED COMPONENT" system for your CV line.

D-S DAVIS-STANDARD
thermatic
Division of FRANKLIN RESEARCH AND DEVELOPMENT CORPORATION
16 WATER STREET, MYSTIC, CONNECTICUT

PRECISION EXTRUSION CONTROL IS OUR BUSINESS

WARDWELLIAN

24 Carrier Cable Braider

With Taping Attachment

Applies Tape and Braid to Conductor Simultaneously

HAS ALL THE FEATURES OF WARDWELL STANDARD 24 CARRIER CABLE BRAIDER

- Taping head has means for adjusting the tension applied to the tape, thereby assuring a uniform lay.

  A mechanical stop motion which operates upon breakage or exhaustion of the supply, stops both the taping head and braider head at the same time. This eliminates the possibility of braiding over the conductor when the tape is not being applied.

  Change gears for altering the lay of the tape are conveniently located at front of the machine.

  Due to the space required for the taping attachment, this machine can be furnished with high stand only.
- Production 54" to 259" per minute depending upon the texture of the product.
- Standard set of twelve change gears furnished with each machine.
- Machine can be adapted to produce one-and-one braid by changing thread deflectors.
- Carrier speed 75 R.P.M. for cables from ¾" diameter to maximum of 1⅛" diameter or 500,000 circular mils; production 900 picks or plaits per minute.
- Carrier speed 100 R.P.M. for cables ¾" diameter and smaller, 1,200 picks or plaits per minute.
- Equipped with "Maxitorq" clutch; 12" driving pulley, 3" driving belt.
- Speed of braider countershaft 345 R.P.M. for carrier speed of 75 R.P.M. or 460 R.P.M. for carrier speed of 100 R.P.M.
- Ratio of braider countershaft speed to carrier speed 4.6 to 1.
- Capstan 36" diameter, 6" face.
- Beater opening 1¾" diameter.
- Supply yarn packages Universal wound, 2-11/16" diameter, 5" traverse on tubes 5¼" long, ⅝" hole, four point wind.
- Counter for measuring product in feet or yards furnished upon request at additional cost.
- Motor drive furnished upon request at additional cost.
- Power required dependent upon conditions. Estimate furnished upon request.
- Supply and windup stands are not furnished.
- Weight approximately 1850 lbs.
- Weight crated for domestic shipment approximately 2000 lbs.
- Weight boxed for export shipment approximately 2500 lbs. or 1134 kilograms.

TAPING ATTACHMENT DATA:

- Maximum number of turns of taping head 100 R.P.M. — minimum 16 R.P.M.
- Maximum diameter of supply package 12".
- Maximum width of tape 3".
- Minimum width of tape ¾".
- Size of hole in tape package 3".
- Taping head is equipped to run either clockwise or counter-clockwise.

REPRESENTATIVES FOR EUROPE, BRITISH COLONIES AND DEPENDENCIES
JAMES MACKIE & SONS, LTD.
BELFAST, IRELAND

Wardwell
BRAIDING MACHINE CO.
CENTRAL FALLS, RHODE ISLAND, U.S.A.

133-9

conductors has been developed to overcome this difficulty.

* * *

For samples and additional information, write Hudson Wire Co., Ossining Div., Ossining, N. Y.

Bulletin on Ceramic for Mounting Sensing Elements

A new bulletin entitled "Mounting Sensing Elements" describes methods of mounting fine wire and foil sensing elements for temperature and strain measuring by means of **Rokide** ceramic spray coatings. This technique is being used to mount such elements in areas subject to high temperatures, such as rocket nozzles, gas turbines, and nose cones, particularly in testing operations.

* * *

For a free copy of this bulletin, write Advertising Department, **Norton Company**, Worcester 6, Mass., requesting Bulletin H-3.1.

Bulletin on Syncro-Range Drives

The Louis Allis Co., Milwaukee, has recently announced the introduction of Bulletin 111 — Syncro-Range-Drives, ranging in sizes 2 to 15 HP, and providing adjustable speed of synchronous induction motors running in exact synchronism over a wide range of speed.

* * *

The drive is an integrated system consisting of an adjustable frequency power supply, one or more Syncro-Spede® drive motors, and a control panel. Adjustable frequency power is supplied from an AC alternator driven by a constant speed squirrel cage induction motor that provides infinitely adjustable speed through the mechanical interaction of adjustable discs and a ribbed belt. By adjusting power supply output, the drive motors can be varied in speed. Control Panel includes alternator field supply and all necessary controls for proper operation of the drive.

* * *

The Syncro-Range Drive is designed for operation of multi-unit conveyors; textile or paper printing or finishing, synthetic fibre

spinning, drawing or twisting; metal run-out tables; and many other similar continuous process machines which require the application of power at a number of points on the machine.

* * *

These drives are completely designed, manufactured and factory tested under simulated field conditions by The Louis Allis Co.

New Cold Transfer Press For Nuts

This new automatic machine made in four sizes manufactured by **Malmedie & Co.** is particularly suited for the efficient mass production of bright-pressed nuts and similar components made of round stock.

* * *

The machine has one shearing station and five press stations, long tool life, strong construction, automatic draw-in control for uniform cut-offs independent of the index timing, shearing mechanism for clean square cuts, large tool spacing, and many other exclusive features.

* * *

Detailed information is available through sole U.S.A. agents, **Straus-Artys Corp.**, 45 No. Station Plaza, Great Neck, N. Y.

New Cable to Aid Commercial Fishing

An "electronic fishing line" developed by **U. S. Steel's American Steel and Wire Division,** holds promise of bigger catches for commercial fishermen.

* * *

The new line, produced at the Wire Division's Electrical Cable Works at Worcester, Mass., actually is a steel cable carrying electrical conductors which could make it possible for commercial fishermen to use a wide range of electrical and electronic devices to indicate the exact depth of their nets, when the nets are on the bottom, the ground speed of their trawl and the size of their catch.

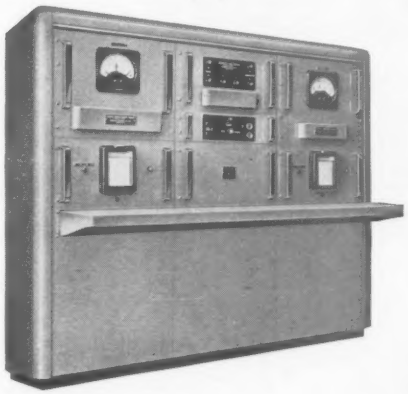
* * *

Once a concentration of fish has been plotted by echo sounding, it is important to keep the trawl on

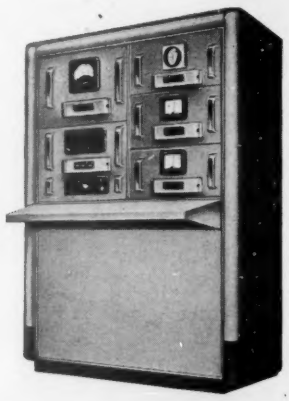
ADDISON ELECTRIC

CABLEMAKERS INSTRUMENTATION

The most advanced—most complete—and most versatile in the world
In use in over 200 Cable plants—and in more than 30 countries



Typical small Extrusion Control Station, combining Automatic Capacitance with Size Control and Recording



Small Extrusion Control Station incorporating Optical Diameter Control and Eccentricity Monitoring.

Ingenious system of building blocks permits extension, modification, and assembly of hundreds of different combinations of Control Stations, to individual requirements, at moderate cost.

ADDISON'S UNIQUE RANGE OF UNITIZED SYSTEMS COMPRISE

- Cable Eccentricity Monitors and Controllers
- Wire Preheaters with Automatic Temperature Control
- Corona Test Sets for scanning and final tests
- Optical scanning Size Monitors and Controllers
- Wall Thickness and Dual Plane Controllers
- Contact Size Monitors and Controllers
- Capacitance Monitors and Controllers
- High Frequency and D.C. Spark Testers
- Cable Impregnation Monitors
- Wire Tension Gages — etc.

SALES & SERVICE: **MUIRHEAD INSTRUMENTS INC.**
441 Lexington Ave., New York 17, N.Y. Tel: Murray Hill 2-8131
432/3

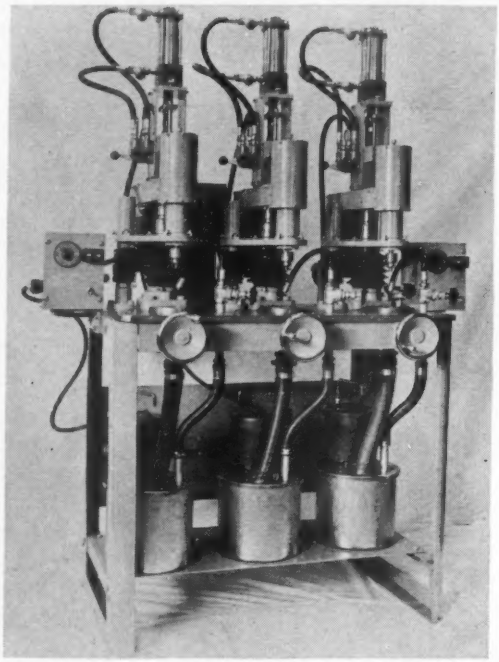
New DYKREX

automatic

MULTIPLE SPINDLE RIPPERS

Patent Pending, U. S. Patent Office

Single – Double or Triple Units



Available as a single spindle unit or in multiples of two and three. Each spindle equipped with a time switch. Abrasive pumps are located beneath the machine table; easily disconnected and cleaned.

RUGGED — hardened and ground-steel upright slides, protected with telescopic pipes.

FAST — Spindle is raised and lowered pneumatically . . . produces rough dies in a fraction of the usual time.

EASILY OPERATED — one man can operate up to 6 spindles at a time.

FACTORY TESTED — in leading wire mills.

Write for information and prices on this new line of Hi-Productive, Labor Saving, Automatic Rippers for Rough Die Finishing of Tungsten Carbide Dies.

DYKREX CORPORATION

P.O. BOX 9022, NORTH STATION, NEWARK 4, N. J.

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Pittsburgh 19, Pa.

Smith-Courtney Co.
Hickory, North Carolina

Or ask your Tungsten Carbide Die Supplier

course and moving at a closely regulated speed. A ground indicator, similar to a speedometer, helps the crew determine progress of the trawl along the sea bottom. Impulses from this contact device, transmitted along the cable from sea depths to the crew above, also aid in maneuvering the trawl close to on-bottom contours.

* * *

The cable, designed to make commercial fishing more scientific, is being tested by the U. S. Bureau of Commercial Fisheries' exploratory fishing vessel, **John N. Cobb,** off the Pacific coast.

Thompson to Sell Union Wire Die Products

Union Wire Die Corporation, with plants in New York City and Stamford, Conn., has announced the appointment of Thompson Associates as its exclusive representative for the state of California. The president of Thompson Associates, **Richard R. Thompson,** has had long experience in the wire industry, and over the course of years purchased and used many of the Union Wire Die products which he will now be selling. These products include diamond dies, tungsten carbide wire dies, carbide dies for rod, bar and tubing, mandrels and floating plugs, diamond powder and diamond compound. With Union Wire Die's line added to the other well-known products such as Steelskin lubricants and Hubbard Spools, which Thompson Associates will be handling, Thompson will be in a position to service many wire and related needs in the state of California.

Diamond Die Firm Expands

Fort Wayne Wire Die, Inc., 2625 E. Pontiac St., Fort Wayne, Ind., has announced the completion of an expansion of its plant facilities that adds 30% more manufacturing space. This will enable the company to provide improved service from coast to coast. Officers of the firm are: **Paul Bieberich,** President, and **Dwight Bieberich,** Secretary-Treasurer. Fort Wayne Wire Die is a leading producer of diamond wire drawing dies and diamond tipped wire guides used in the extrusion of plastic insulating coatings onto wire.

Introduces New Nickel Brightener

A new nickel brightener, Nimax BN-30, is now being introduced by Federated Metals Division of **American Smelting & Refining Company.**

* * *

The new brightener is a concentrated single addition agent, specially formulated to yield brilliant barrel nickel deposits. Used in conjunction with BN-10 additive, it produces bright nickel deposits which readily accept chromium plating.

* * *

Nimax BN-30 has a broad tolerance to variations in both solution concentration and current density.

* * *

Technical details may be obtained from Federated Metals Division, American Smelting & Refining Company, 120 Broadway, New York 5, N. Y.

New AWS Soldering Manual

The American Welding Society recently announced the publication of the first manual on soldering ever published. Containing 176 pages, 81 illustrations and 34 tables, the book completely covers all phases of soldering, combining the theoretical with the practical.

* * *

The twenty-one chapters deal with the following subjects: principles of soldering; solders; fluxes; joint design; precleaning and surface preparation; equipment, processes and procedures; flux residue treatment; inspection and testing; copper and copper alloys; steel; coated steels; stainless steels; nickel and high-nickel alloys; lead and lead alloys; aluminum and aluminum alloys; magnesium and magnesium alloys; tin; cast irons; precious metal coatings; printed circuits; and safety.

* * *

Chemical composition of hundreds of solders are given, together with flux formulations for the various metals. Copies may be had from the American Welding Society, Department T, 33 West 39th Street, New York 18, N. Y., at a list price of $5.00.

MATCHED COMPONENTS
mean Precision Extrusion Control

"Matched Component" wire Insulating Systems increase productivity and eliminate wasted capacity. From missile wire to transoceanic cable, D-S properly-designed components give better quality at lower cost.

- Wire line speeds up to 4000 feet per minute
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- Complete Systems for all types of thermoplastic and rubber insulating lines

Anything less than D-S "MATCHED COMPONENT" capacity is costing you money

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Division of
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thermatic
8 WATER STREET, MYSTIC, CONNECTICUT

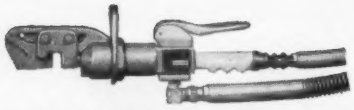
NEW DESIGN

MANCO Hydraulic Guillotine®

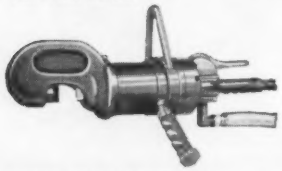
WIRE AND ROD CUTTERS

Big Capacity

FAST • EASY TO USE



MODEL MC 210 Capacity ½" High speed . . . ½ second per cut for steel rod to ½". Full swivel action.



MODEL MC 35 Capacity 1" Cuts high carbon material including reinforcing rod and heat treated chain to 1" diameter in 1¼ seconds per cut.

MODEL MC 65 Capacity 1¼" Cuts 1¼" diameter steel in 2 seconds per cut. Can be modified to cut 1⅛" diameter aluminum.

Big Time and Money Saver for Rod Mills and Users of Wire and Rod

Ideal for production cutting, trimming off cobbled ends, taking test samples and splitting bundles on docks.

Manco has completely redesigned the Guillotine line of wire and rod cutters now used by major rod mills throughout the world. These new Manco Guillotine units give high efficiency, heavy duty performance, with a 75% slash in tool maintenance costs.

New Interchangeable Blade and Anvil

Interchangeable blade and anvil means wear points can be reversed for virtually double life. Three blade styles for various cutting requirements. There is a new simplified valve design with hardened and ground parts for longer life. Also, new Meehanite piston with large bearing surface and a new piston seal assembly that permits quick replacement.

These Guillotine units powered by Manco Hi-Thrust Electric Hydraulic Pumps

Write for Complete Information W-10

WRITE FOR CATALOG

MANCO MFG. CO., Bradley, Illinois
Please send:

☐ Catalog of new Guillotine Wire and Rod Cutters.

Name .....

Firm .....

City ..... Zone ..... State .....

New 50 Pound Coil Stitches Over 17,000 Boxes

Flat coppered box stay wire has just been made available on a new 50 pound coil, according to an announcement by **J. R. Fuller,** manager of the Prentiss Wire Mills, Riverside-Alloy Metal Division, H. K. Porter Company, Inc., which doubles the conventional coil size.

* * *

Ideal for large automatic stitchers, it has been estimated that the 50 pound coil contains enough wire to make 106,000 stitches. Based on an average of one inch per stitch and six stitches per carton, the new Prentiss coil could staple 17,800 cartons without down-time.

* * *

For many years, the five pound coil was standard. Following World War II, however, stitchers were developed to accommodate a larger coil. Prentiss then developed a ten pound coil, still regarded as a standard put-up. A 25 pound coil was made available by Prentiss a few years later for more advanced equipment. The latest addition to the coil size has enabled users with large automatic stitchers to utilize Prentiss wire and slash down-time.

Borden Plans PVC Plant

Construction by **The Borden Chemical Company** of a polyvinyl chloride plant in Illiopolis, Illinois, with a total capacity of 40 million pounds, has been announced by **A. R. Marusi,** president.

* * *

The new plant will be located adjacent to the company's existing manufacturing facilities there. A 20-acre tract of land has already been purchased and engineering for the project is nearing completion.

* * *

The company, in addition to PVC, is a major producer of thermoplastic products such as polyvinyl acetate, butadiene styrene, and acrylic emulsions for the paint, paper coatings, and adhesive fields, and polyvinyl alcohol for use in emulsions and adhesives.

* * *

Borden Chemical produces these products at Los Angeles, Calif.; Leominster, Mass.; Bainbridge, N. Y.; Demopolis, Ala.; and Illiopolis, Ill. plant locations.

Outstanding Personalities of the Wire Industry

Swift Research Head's Duties

Dr. H. E. Robinson, Swift & Company vice president in charge of research laboratories, engineering research and equipment development, has assumed supervision of a number of products-for-industry operations, succeeding **E. A. Moss**, vice president, who retired June 23.

* * *

Swift departments now under Dr. Robinson, in addition to General and Engineering Research, include adhesives, gelatin, stabilizers, soap and Chemicals, and the Technical Products Plant at Hammond, Indiana.

* * *

Dr. Robinson joined the Swift research staff in 1932, became assistant director of research in 1941, assistant director of laboratories in 1950, director of laboratories in 1953 and was elected vice president in 1959. He has degrees from the University of Montana and University of Pittsburgh and is a graduate of Harvard University's advanced management program.

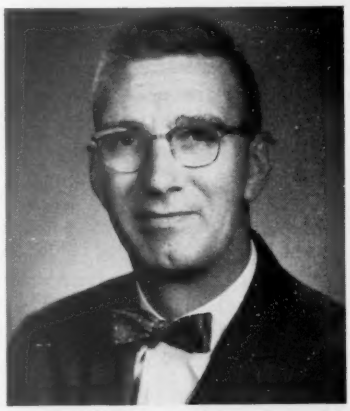
Dr. H. E. Robinson

Whitney Blake Names Superintendent

Walter W. Kesteloot, Vice President & Works Manager of the **Whitney Blake Company,** Hamden, Connecticut, has announced the appointment of **Hugh MacKellar** as General Plant Superintendent.

* * *

Mr. MacKellar has been with the company since 1936 and was previously Division Superintendent. In his new assignment, he will



Hugh MacKellar

Marking Machines, Wheels & Inks

FOR INSULATED WIRE, TUBING AND PIPE—

Type VDM — Illustrated has these Features:

1. Use present towers, no changes necessary.
2. One filling of ink well, gives 18 HOURS of continuous simulated spiral striping, number coding or printing.
3. For single or double marking or hash mark striping.
4. Constant wiper pressure.
5. Diam. range .032 thru 1½".

GEM GRAVURE CO., INC.
West Hanover, Massachusetts, U. S. A.
CABLE ADDRESS: GEMGRA
Telephone: ROCKLAND TRiangle 8-0456

IN THE MARKING OF EXTRUDED MATERIAL THERE ARE BIG ADVANTAGES IN ONE SINGLE SOURCE OF SUPPLY.
KNOW-HOW • INKS • WHEELS • MACHINES

West Coast Representative: Paul I. Kenner Co., 230 Shaw Rd., So. San Francisco, Calif.
West Germany: Walter G. Fritzke GMBH, AM Wehrhahn 94-96, Dusseldorf, W. Germany

be responsible for all of the manufacturing operations of the plant involving insulated wire and cable, cord sets, electronic connectors, and printed circuits.

English Engineer Visits Davis-Standard

Kenneth Hartley, sales engineer in charge of extruder sales, **Fawcett-Preston,** Bromborough, England, has just completed a three-week visit to **Davis-Standard,** Division of Franklin Research & Development Corp., Mystic, Conn. He was recently appointed to the top sales position of the British firm, a manufacturing licensee of Davis-Standard extrusion machinery for the Sterling area of the free world.

* * *

During his visit, Mr. Hartley traveled throughout the U. S. with Davis-Standard sales engineers observing American production techniques and equipment and studying our markets and applications.

* * *

While at Mystic, he was a guest of **Philip C. Greene,** General Manager of Davis-Standard. He started his career with Fawcett-Preston more than twenty years ago in the tool room and progressed to his current position as sales engineer, extrusion equipment. He is a licensed engineer.

Appoints Detroit District Office Manager

W. J. Prevost has been named Office Manager of the Detroit District Office of **Union Carbide Plastics Company,** Division of Union Carbide Corporation, according to an announcement by **J. M. Herbert,** Sales Manager — North Central Region.

* * *

In his new position, Mr. Prevost will be responsible for the direction of all office functions. He will be located at 10421 W. Seven Mile Road, Detroit 21, Mich.

* * *

Also announced was **Arthur Kneessy's** appointment as a Technical Representative in the North Central Sales Region. He will handle the sale of Bakelite molding and extrusion materials, which include polyethylene, phenolic, styrene, and vinyl resins and compounds. He will be located in the Company's Rochester Sales Office at 3700 East Avenue, Rochester 18, N. Y.

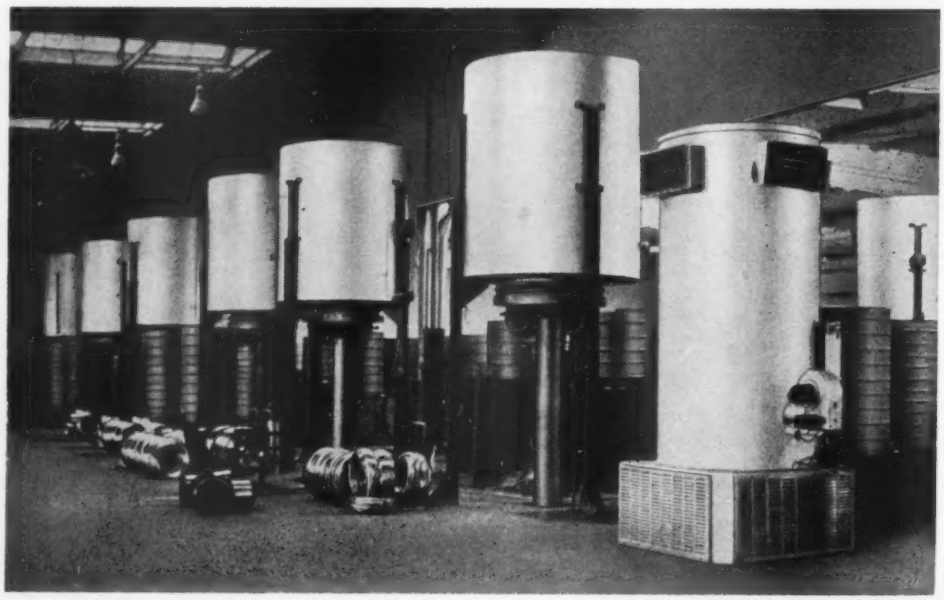
To Sell Silicones for G.E.

James B. Lovell has been appointed sales representative for the Central District of the Silicone Products Department, General Electric Company. His office location is 540 South 1st Street, Milwaukee, Wis.

* * *

He is a 1953 graduate of Michigan State University where he received a Bachelor of Arts degree in Economics. He also holds a Master's Degree in business administration from Harvard Business School. He joined the General Electric Company in 1955 on the Company's marketing training program and a year later was ap-

THE LAST WORD IN MODERN EFFICIENT DESIGN!



SEVERAL VACUUM BRIGHT ANNEALING UNITS WHICH WE HAVE INSTALLED IN ONE OF THE MOST PROMINENT CABLE WORKS IN GERMANY

(German and Foreign Patents)

*

SOLE REPRESENTATIVE:
PAUL REICHER
Machinery & Equipment
600 Eglington Ave., East,
Toronto 12, Ont., Canada

OFENBAU **FRITZ** G. m. b. H. & Co. K. G. **HAGEN,** (W.-GERMANY)

pointed a regional marketing specialist in G.E.'s Communications Products Department. He served in that capacity prior to joining the Silicone Products Department last year.

Welding Firm Elects New President

Election of **Simon "Si" Fisher,** general manager of **National Electric Welding Machines Co.,** as president succeeding **Edward C. Smith,** who has resigned, has been announced. Mr. Fisher will remain as general manager, a post he has held since 1955.

* * *

Mr. Smith, president of the company since 1933 when he and four others organized it, will step up to a newly created office as chairman of the board.

* * *

Mr. Fisher joined National Electric in 1935 as a shop electrician. Four years later he was placed in charge of the experimental department. In 1941 he joined the sales staff and in 1946 was appointed director of sales and was elected to the board of directors. He is a graduate electrical engineer from Antioch College, Ohio.

* * *

A major supplier of resistance welding and related automated equipment, National Electric has declared 90 consecutive quarterly dividends in the past 22 and one-half years.

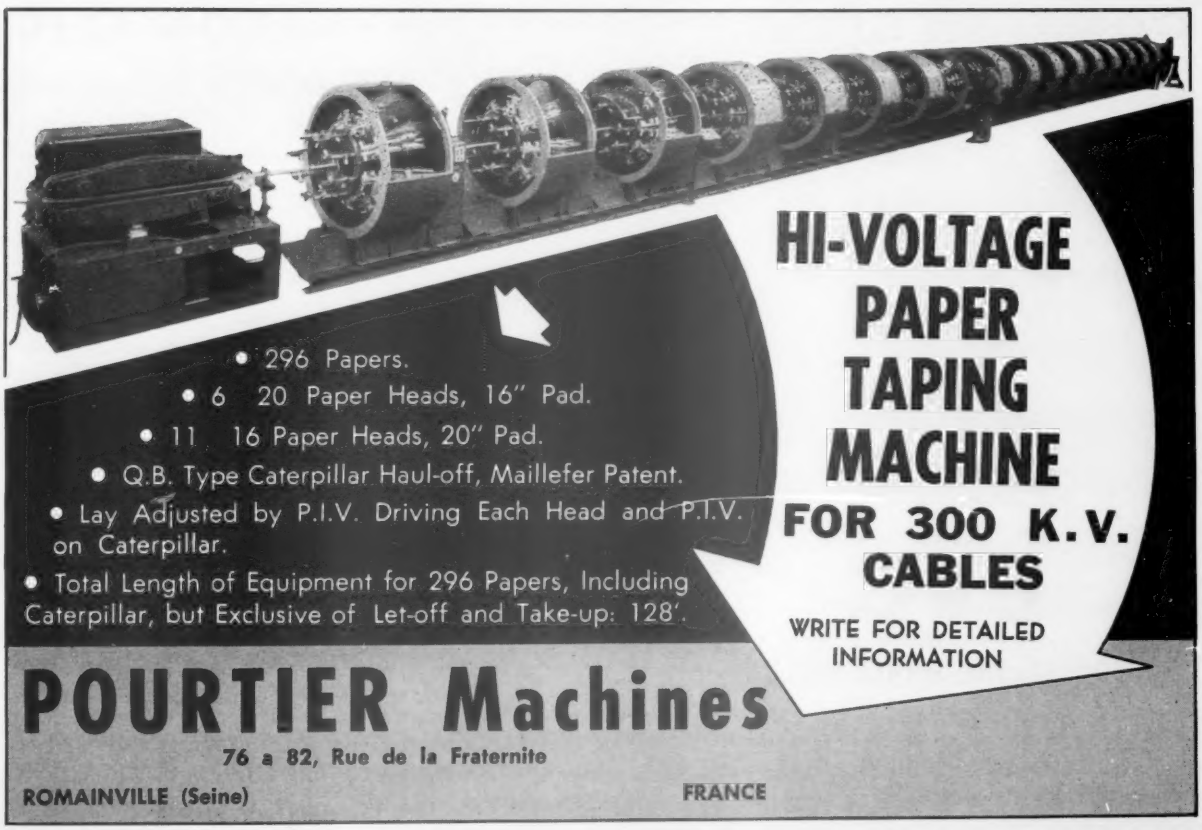
Simon Fisher

Union Carbide Appoints Technical Representative

Richard A. Behrens has been appointed Technical Representative in the North Central Sales Region of **Union Carbide Plastics Company,** Division of Union Carbide Corporation. According to **J. M. Herbert,** Regional Manager, Mr. Behrens will handle the sales of Bakelite Brand vinyl, phenolic, and epoxy resins and compounds for coatings. He will be located in the Company's office at 1300 Lakeside Ave., N.E., Cleveland, Ohio.

* * *

Mr. Behrens was graduated with a Bachelor of Science degree in Chemical Engineering from the University of Wisconsin. He joined Union Carbide Plastics in 1957. After completing his technical sales training, he went to the Company's Chicago office for a special sales assignment. During the past two years, he has been a member of the New Product Market Development Department in New


HI-VOLTAGE
PAPER
TAPING
MACHINE
FOR 300 K.V.
CABLES
• 296 Papers.
• 6 20 Paper Heads, 16" Pad.
• 11 16 Paper Heads, 20" Pad.
• Q.B. Type Caterpillar Haul-off, Maillefer Patent.
• Lay Adjusted by P.I.V. Driving Each Head and P.I.V. on Caterpillar.
• Total Length of Equipment for 296 Papers, Including Caterpillar, but Exclusive of Let-off and Take-up: 128'.
WRITE FOR DETAILED INFORMATION
POURTIER Machines
76 a 82, Rue de la Fraternite
ROMAINVILLE (Seine)
FRANCE

York City working on the promotion of epoxy resins.

Firth Sterling Names Director of Purchases

Glenn A. Wilson has been appointed director of purchases and special projects for **Firth Sterling, Inc.**

* * *

Mr. Wilson joined Firth Sterling 10 years ago and has served in a number of management posts. He continues as vice president and general manager of Strategic Metals Corporation, and as vice president and director of Borolite Corporation, both of which are Firth Sterling subsidiaries.

Textile Machine Adds to Staff

Textile Machine Works' Board of Directors has announced the appointment of **Albert E. Edwards** to the newly created position of Assistant Vice President — Manufacturing. He will work under **E. W. Kaul,** Vice President — Manufacturing.

Seymour Elects Brown Vice President

George T. Hubbell, president of **The Seymour Manufacturing Company,** Seymour, Conn., has announced the promotion of **William G. Brown** to vice-president and sales manager of the company.

* * *

In 1945 Mr. Brown joined The Seymour Manufacturing Company as metallurgist and trouble-shooter, after serving with the Western Brass Co. and American Brass in Canada for a number of years. Three years later, he became works manager of the Phosphor Bronze Corporation, and in 1951 was appointed a research engineer for the Olin Mathieson Corporation, engaging in research in metals.

* * *

Mr. Brown returned to the Seymour Manufacturing Company in 1956, becoming successively production manager, plant superintendent, and works manager. He held the last position until his current appointment. He attended the Lowell Technological Institute.

Autolite Adds to Sales Staff

Two new appointments for the western region for **The Electric Autolite Company's** replacement sales division have been announced by **E. T. Duffy,** director of replacement sales. **James W. Fairbanks** has been named western regional manager, national accounts, and **Ward W. Robbins** succeeds him as western regional manager, replacement sales.

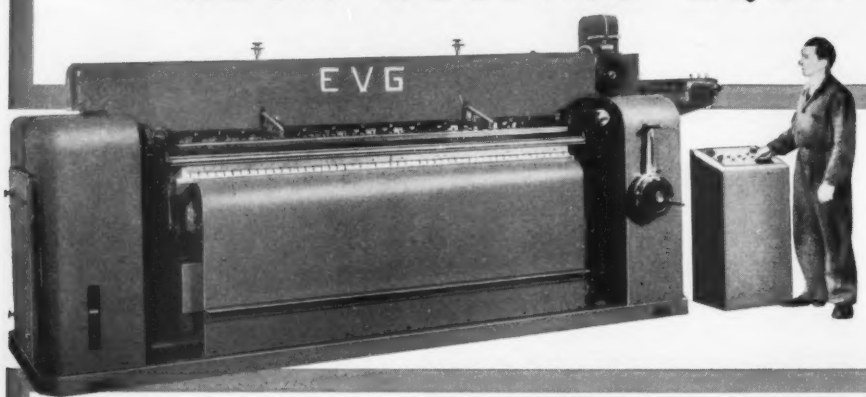
* * *

Mr. Fairbanks has been with Autolite since 1936. In his new post he will headquarter in San Francisco and provide Autolite with added representation in a market that Mr. Duffy indicated is becoming increasingly important.

* * *

Mr. Robbins will be in charge of all sales of Autolite spark plugs, wire and cable, electrical service parts and batteries in 11 western states. He first joined Autolite in 1940.

COMPLETE LINE OF FULLY AUTOMATIC MESH WELDING EQUIPMENT



EVG designs and builds the world's most complete line of wire fabric welding machinery—five complete plants covering the entire field of welded mesh. Wire sizes from 7/0 to 25 gauge; all conventional spacings, down to 4 mesh (¼" x ¼"). Special plants can be engineered to customer's specifications.

EVG

COVERS THE WHOLE FIELD OF WELDED WIRE FABRIC

1. **Heavy Duty** model G 6 — designed to handle the heaviest meshes in use, i.e., pipe meshes.
2. **Standard Duty** — handles all constructions specified by engineers for reinforcing road fabrics.
3. **Medium Duty** — a specialized machine for the low-cost production of building mesh and similar fabrics.
4. **Light Wire** machine — a high precision welder, specifically designed for the production of visual type fabrics; fencing, mink batteries, etc.
5. **Fine Wire** machine — an extra high speed, flexible changeover welder. Particularly suited to the production of welded hardware cloth in all gauges and spacings.

Please direct inquiries to: **RICHARD E. KLEINHANS** *U. S. — Canadian Representative*

122 East 42nd Street, New York 17, New York • OXford 7-0770

Reynolds Appoints Manager of Phoenix Extrusion Plant

Edwin G. Drewry has been named manager of the Phoenix, Arizona, Extrusion Plant of **Reynolds Metals Company,** according to **L. H. Graves,** general manager of the firm's extrusion division. Mr. Graves also announced the appointment of **James M. Hairston** to the post of plant superintendent. **R. V. Bobb,** who has served as acting manager of the plant for the past 12 months, will return to the company's headquarters at Richmond, Va., to resume his former duties as assistant general manager of the extrusion division.

* * *

Mr. Drewry has been assistant to the plant manager at Phoenix for the past year. An engineering graduate of the University of Toronto, he has more than 20 years' experience in the metals industry.

* * *

Mr. Hairston was Phoenix plant controller from 1953 to 1957. He is a graduate of the University of Alabama and joined Reynolds in 1946.

Union Carbide Appointments

J. C. Malone has been appointed assistant to the general manager of the Silicones Division, **Union Carbide Corporation,** effective August 1, according to **R. S. Abrams,** the division's general manager. Mr. Malone comes to his new post from the Institute, W. Va., plant of UCC's Chemicals Company, where he was assistant superintendent.

* * *

Mr. Malone will be located in New York, working on special assignments for the general manager involving all aspects of the silicones business.

* * *

At the same time, it was announced that **C. T. Schieman, Jr.** has been appointed general sales manager for the Division, **P. S. Manchester,** assistant general sales manager, and **R. S. Wishart** has been appointed manager, product marketing, reporting to the general manager.

* * *

Other appointments include that of **Dr. T. F. Hart** as product manager of fluids, and **J. H. Lorenz** as product manager of resins and water repellents.

* * *

Changes in the field sales group are the appointment of **T. J. Fontelieu, Jr.** as Eastern region manager; **F. S. Phinney** as Southern region manager, and **C. F. Tripp** as region product manager, Eastern region.

R & D Engineer Joins Cable Firm

The increasing use of plastics in intricate missile, rocket and electronic cable systems, to be manufactured by **Custom Systems Corporation** in their new plant at 3000 W. Delhi Road, Santa Ana, Cal., will be a major research project of **Casimer J. Woldanski,** who has joined the firm as research and development engineer.

* * *

Mr. Woldanski, who brings 20 years of practical experience to the

800 times
round the Equator reach the
4.9 million tons
of wire rods produced by us in all
home-market- and export qualities.
Our new wire-rod mill
produces a material with
smallest tolerances of diameter
and heaviest coil-weights.
H
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HÜTTEN- UND BERGWERKE RHEINHAUSEN AG
HÜTTENWERK RHEINHAUSEN · GERMANY
Agent: M. WIMPFHEIMER & SON, INC. 250 WEST 57th STREET, NEW YORK 19, N.Y. TEL. CIRCLE 6-9384

firm, said "Our entire plant and staff is geared to keep pace with the swiftly-moving nuclear and space age. Cables and cable systems are not the simple conductors they were a few years ago. Today, they must not only be able to function at high altitudes, but at extreme underwater pressures. "

* * *

When in full production, CSC will become one of the nation's two largest manufacturers of custom electric cable systems. The firm's products will be designed to meet individual customer specifications and will be distributed to an international market.

Wire Men Become Officers of Controllers Institute

Frederick C. Sheppard, treasurer, **The Bristol Brass Corporation,** Bristol, Conn., has been elected secretary of the Hartford Control of the Controllers Institute of America and **Roland L. Sylvester,** comptroller and assistant treasurer, **Associated Spring Corp.,** also of Bristol, was elected a director.

* * *

At the annual meeting of the Institute's Hamilton Control, **Norman F. Jefferson,** treasurer and comptroller, **The B. Greening Wire Company, Ltd.,** and **Reginald E. Oliver,** treasurer and controller, **Donald Ropes & Wire Cloth Ltd.,** were made directors.

* * *

Robert N. Perry, controller, **The Lindsay Wire Weaving Co.,** has been named to the board of the local controllers' group in Cleveland.

* * *

Established in 1931, the Institute is a non-profit management organization of controllers and finance officers from all lines of business. The total membership exceeds 5,200.

Farrel-Birmingham Names New Pittsburgh Representative

Farrel - Birmingham Company, Inc., Ansonia, Conn., has announced the appointment of **Walter J. Hegedus** as Field Sales Engineer in the Pittsburgh area to handle sales of the company's general products and rubber and plastics machinery lines. He replaces **David Neill,** who has been transferred to the Farrel home offices in Ansonia as Manager of Roll Grinding Sales.

* * *

Mr. Hegedus has been engaged in industrial sales work for the past decade since his graduation from Fenn College, Cleveland, with a degree in Mechanical Engineering. Since 1958 he has been associated with the Farrel Akron office and will continue to make his headquarters there.

Viking Wire Expands Sales Staff

Alfred J. Foley, has joined the sales staff of **Viking Wire Company, Inc.,** Danbury, Conn., manufacturers of **film insulated magnet wire,** according to an announcement by **John W. Hoffer,** president.

presenting

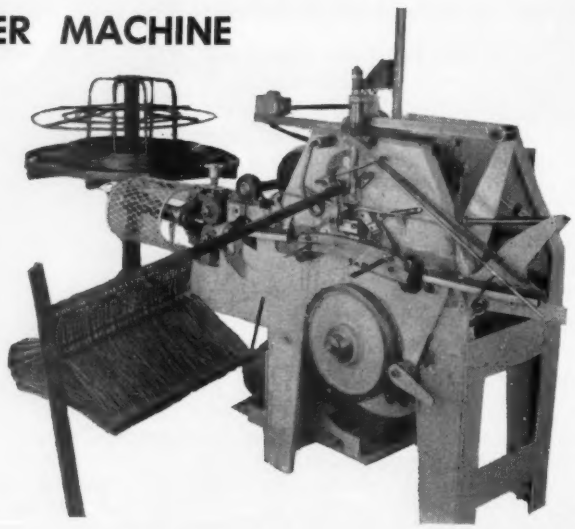
THE WICHITA GARMENT HANGER MACHINE

a modern machine
for the profitable manufacture of
standard **16"**

Wire Garment Hangers

Efficient — Economical — Dependable
designed for easy operation
complete with motor & controls

CAPACITY: 2000 Hangers per hour
Gauges: 12, 12½, 13
(can also be arranged for larger or smaller gauges.)



Sturdy construction throughout — Carbide Inserts or hardened steel on all wear parts.
Machine straightens wire, cuts to proper length, forms hanger and kicks it onto a bar, at the rate of 40 per minute.

write for quotations to:

WICHITA WIRE PRODUCTS COMPANY, INC.
(founded in 1923)
624 East Harry Street, Wichita 11, Kansas

EXPORT DEPARTMENT:
Seybold Transworld Exporters
122 East 42nd St., New York 17, N. Y.
(USA)

Mr. Foley was formerly with Sigma Instruments Company for 14 years and served as purchasing agent for nine years. Mr. Foley, who has had considerable experience in the magnet wire and electronic industries, will work directly with the national sales manager, **Simon J. Warschauer.**

* * *

Mr. Hoffer stated that the addition of Mr. Foley to the Viking Wire sales organization is part of the company's program of expanded sales and distribution for its magnet wire products. The company recently built one of the most modern plants in the magnet wire industry in Danbury, Conn.

Union Carbide Plastics Assigns Sales Representative

John B. Hollingsworth has been assigned as a Technical Representative in the North Central Sales Region of **Union Carbide Plastics Company,** Division of Union Carbide Corporation. According to the announcement by **J. M. Herbert,** Regional Manager, Mr. Hollingsworth will handle the sale of Bakelite Brand plastics for molding and extrusion. These include polyethylene, vinyl, phenolics and styrene resins and compounds. He will be located at the Company's office at 1300 Lakeside Avenue, N.E., Cleveland, Ohio.

Firth Sterling Appoints Detroit Representative

Firth Sterling, Inc., has appointed **David G. Crownover** to Detroit district manager, carbide division. He joined the company in Detroit 10 years ago and has served as salesman in the district for the past 6 years. In his new capacity, he will be responsible for the sale of carbide products in the Detroit area.

To Sell Silicones for G.E.

G. Stephen Glaser has been appointed sales representative of the Eastern District of the **Silicone Products Department** of the **General Electric Company.** His office location will be 254 Elizabeth Avenue, Newark, N. J.

* * *

A graduate of Princeton and Northwestern Universities, Mr. Glaser holds degrees of Bachelor of Science in Mechanical Engineering and a Master's of Business Administration. Following his graduation from Princeton in 1955, he joined E. I. du Pont de Nemours and Company, Inc. where he served as a project engineer until 1957. He became associated with G.E. in 1958 on the Company's marketing training program.

R B & W Names Jones to Export Sales Post

Ward K. Jones Jr., has been appointed export manager of sales for **Russell, Burdsall & Ward Bolt and Nut Co.,** according to an announcement by **John S. Davey,** vice president in charge of sales. Mr. Jones succeeds **William P. Rave,** who retired March 31 after 26 years with R B & W. Mr. Jones joined R B & W in 1946 after three years Air Force service and has

BEFORE YOU BUY...

YOUR NEXT METAL OR COMPOSITION SPOOL — CHECK (✓) THE ADVANTAGES OF "PLASTISPOOLS" BY THE BOONTON MOLDING COMPANY. THEY ARE...

RUGGED ✓ LIGHT WEIGHT ✓ ONE PIECE ✓ SMOOTH ✓

...And Come In These Standard Wire-Winding Sizes:

#1 — 2½" Head, 3" Traverse, 1¾" Barrel, ⅝" Arbor Hole ☐

#3 — 3" Head, 3" Traverse, 1½" Barrel, ⅝" Arbor Hole ☐

#5 — 4½" Head, 3" Traverse, 2" Barrel, ⅝" Arbor Hole ☐

#8 — 6" Head, 3" Traverse, 2¼" Barrel, ⅝" Arbor Hole ☐

OF COURSE SAMPLES ARE AVAILABLE! — JUST CHECK THE SIZE YOU'D LIKE TO SEE AND THEY'LL GO FORWARD POST-HASTE, ALONG WITH A COMPLETE PRICE LIST. FOR YOUR CONVENIENCE YOU MAY TEAR OUT THIS AD, ATTACH TO YOUR LETTERHEAD AND SEND TO:

BMCO **BOONTON MOLDING CO.**

BOONTON, NEW JERSEY TELEPHONE DEerfield 4-4400

been engaged in various sales assignments prior to this appointment.

Carpenter Appoints Asst. Manager Electronic Alloy Sales

W. Kent Kise, Jr., has been appointed by **The Carpenter Steel Co.**, Reading, Pa., as assistant manager, electronic alloy sales, with headquarters in the Reading office. He had served Carpenter for more than two years as supervisor of magnetic and expansion alloy research.

* * *

Prior to joining Carpenter in 1958, he was associated with Electro Plastic Corporation, manufacturers of magnetic material components; Dynacor, Inc., a subsidiary of Sprague Electric; and with the Naval Ordnance Laboratory, Magnetics Division, where he developed several magnetic amplifier and switch core production methods for which patents are now pending.

Named Assistant Manager by Hoosier Wire Die, Inc.

Frederick W. Aumann has been named Assistant Manager of **Hoosier Wire Die, Inc.**, Fort Wayne, Ind., manufacturers of diamond dies for the wire industry.

* * *

Gilbert O. Hoffman, General Manager, said that in his new capacity, he will call on buyers of diamond dies. When he is not traveling as a salesman, he will be in charge of final inspection at the plant.

* * *

Mr. Aumann, who has come up through the ranks at Hoosier Wire Die, is familiar with all steps in die making and will be able to give authoritative answers to all diamond die problems.

Frederick W. Aumann

Two Maintenance Superintendents Appointed By Y S & T

New superintendents of maintenance have been named for both the Campbell and Brier Hill plants of **The Youngstown Sheet and Tube Company.**

* * *

Bernie P. Askew, a 37-year veteran with the company, has been assigned to the post at Campbell Works, succeeding **William T. Morris**, retired. He has been assistant superintendent since 1948.

* * *

Paul F. Schmidt, with the company since 1934, heads the maintenance department at the Brier Hill Works. He previously was maintenance foreman at Youngstown's rod and wire mill at the Struthers plant.

WIRE MILL FURNACES

In the world of wire, the following GASMACO Furnaces are speeding production and improving quality . . .

BILLET HEATING—GASMACO reverse flueing . . . recuperative . . . designed to eliminate mill delay problems . . . single zone and double zone . . . up to 100 tons/hr.

PATENTING—GASMACO patented* silicon carbide radiant tubes permit high temperature operation with atmosphere . . . also direct-fired . . . either type supplied complete with lead quench or acid bath . . . up to 8000 lbs./hr.

ANNEALING—GASMACO single stack, direct-fired design . . . for rod or wire . . . alloy inner cover . . . tangentially fired . . . special pedestals.

GALVANIZING—GASMACO special design . . . fired along sides of tank . . . no flame impingement . . . reduces drossing.

THE GAS MACHINERY COMPANY, INDUSTRIAL FURNACE DIVISION
16128 Waterloo Road, Cleveland 10, Ohio
In Canada: The Gas Machinery Co. (Canada) Ltd., Hamilton, Ont.

*Send for Bulletin A-106 GASMACO SILICON CARBIDE RADIANT TUBE FURNACE IMPROVES WIRE PATENTING OPERATION.

Check first with GASMACO for latest industrial furnace designs.

THE gas machinery COMPANY
GAS PLANT EQUIPMENT
AND INDUSTRIAL FURNACES

To Handle X-Ray Equipment In Midwest

Doan Ryle, noted specialist in industrial x-ray equipment and nondestructive testing, has been appointed manager of the X-Ray Division of **Labquip, Inc.,** Chicago.

* * *

Labquip is midwestern distributor for the **Balteau Electric Corp.,** Stamford, Conn., manufacturers of the Baltospot and Baltograph line of portable industrial x-ray units.

* * *

As divisional manager, Mr. Ryle will be responsible for Balteau sales and service in Illinois, Michigan, Wisconsin and Indiana.

Made Product Manager By Autolite

Virgil Steinmeyer, eastern regional sales manager of **The Electric Autolite Company's** wire and cable division, has been named product manager for the division with headquarters in Port Huron, Mich.

His appointment to the new post was announced by **K. L. Gackel,** sales manager for Autolite's wire and cable and industrial instrument divisions, to implement an expanded sales program for Autolite wire and cable in the industrial, electrical, automotive, aircraft and missile markets.

* * *

Mr. Steinmeyer has been with Autolite and predecessor firms since 1929 and has progressed through posts of increasing responsibilities in the wire and cable operations.

Named Works Manager Of Seymour

George T. Hubbell, president of **The Seymour Manufacturing Company,** Seymour, Conn., has announced the appointment of **George N. Stuart** as works manager of the company.

* * *

Mr. Stuart comes to Seymour with many years of experience in industrial management. From 1933 to 1947 he was associated with the Chrysler Corporation, Chevrolet Motor Division of General Motors, The Western Cartridge Company, and with X-Ray, Inc., where he was vice president and general manager.

* * *

In 1947 he joined the Olin Mathieson Chemical Corporation and held several executive positions with the company in New Haven. In 1955 he become plant manager and production manager of the company's plant in East Alton, Illinois, where he served until joining Seymour.

* * *

Mr. Stuart attended the Detroit Institute of Technology in his home city and is a graduate of the University of Michigan.

SKF Names Reed Division Plant Manager

Appointment of **Calvin C. Weigold** as plant manager of the **Reed Instrument Bearing Co., Los** Angeles, Calif., a division of SKF, has been announced by **Karl Kesselring,**

NONRETURNABLE REELS FOR MAGNET WIRE

WITH THESE SPECIAL FEATURES

SMOOTH, BURNISHED EDGES

LARGE FLANGE AREA FOR SILKSCREENED COPY

SPECIAL SIZES POSSIBLE WITHOUT SPECIAL CHARGES

SHIPPED ON PALLETS - - - EITHER BY TRUCK OR IN DAMAGE FREE CARS

DURKEE MANUFACTURING CO. INC.

PINE RIVER MINNESOTA

SKF vice president in charge of production.

* * *

Reed's miniature and instrument bearings are used in the electro-mechanical, electronic instrument, aircraft-missile, and automatic equipment fields.

* * *

Mr. Weigold joined SKF in 1958 as a senior staff industrial engineer, and earlier was employed by Linear, Inc., of Dallas, Pa., as manufacturing-engineering manager. He is a graduate of Pennsylvania Military College.

Metallurgist and Two Assistants Named By Carpenter Steel

Appointment of a metallurgist and the promotion of two men to assistant metallurgists has been announced by **The Carpenter Steel Co.**, Reading, Pa.

* * *

John W. Keegan has been appointed metallurgist — hot and cold heading steels. He will assist in field service and development of cold heading business.

* * *

Andrew R. Walsh has been promoted to assistant metallurgist — high temperature alloys. Formerly in the Mill Metallurgy Department, his new position will involve servicing and promoting of high temperature alloys.

* * *

Charles A. Divine, Jr., formerly on Carpenter's Technical Service Department and Stainless Steel Research and Development staffs, was promoted to assistant metallurgist — stainless steels.

Times Wire Appoints Distributor Sales Manager

Effective immediately, **Warren S. Jones** has been appointed Distributor Sales Manager by **Times Wire and Cable Division** of The International Silver Company. In his new capacity, Mr. Jones will be responsible for national sales of Times' broad line of R/G coaxial cables to MIL-C-17C and custom designed coaxial cables thru electronics and electrical distributors.

* * *

Prior to joining Times as a Sales Engineer in January, 1960, he was Asst. Sales Manager for Rockbestos Wire and Cable, Division of Cerro de Pasco.

Basil Heads Rockbestos

Alexander S. Basil has been named president of the **Rockbestos Wire & Cable Co.**, a division of Cerro de Pasco Corporation, a producer and fabricator of nonferrous metals, it was announced by **Robert P. Koenig**, Cerro president.

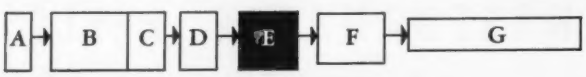
* * *

Rockbestos is a manufacturer of electrical wire and cable, specializing in heat and flame resistant insulations. Its products, which are marketed nationally, are produced at its New Haven, Conn., plant.

* * *

Prior to his appointment as Rockbestos president, Mr. Basil was vice president and general

EXECUTIVE REPORT #8



ROD DESCALING, COATING AND DRAWING IN ONE CONTINUOUS OPERATION

at Lamson & Sessions Co.

In their new and ultra-modern Cleveland plant, Lamson & Sessions Co. has proved that Wheelabrator straight-line blast descaling is the shortest distance between hot rolled rod and wire profits.

Their automated descaling line starts with hot rolled rod on a payoff reel (A), provides a portable welding station (B) for joining successive coils, passes through a snarl switch (C) and straightener-leveler (D), through the Wheelabrator blast descaling cabinet (E), through coating and drying equipment (F) and to the draw block and re-coil unit (G) — all in a straight line, with no interruption and no intermediate handling.

This efficient method is made possible by the speed and thoroughness of Wheelabrator airless blast descaling, which removes all scale or rust down to virgin metal, without acid pickling, at speeds as dictated by subsequent operations.

WHEELABRATOR method lets you automate your wire and bar drawing lines

With the Wheelabrator method, you can blast clean in line with patenting, cold drawing and cold heading. To see how many leading producers are saving with this system, write for Bulletin 148-D. Wheelabrator Corp., 389 S. Byrkit St., Mishawaka, Ind. Canadian Division: P. O. Box 490, Scarborough, Ont.

manager, a position he held since October 1959. He first joined Rockbestos in July 1957 as works manager, following more than 30 years with the United States Rubber Company, where his most recent position was general sales manager for electrical products. He was graduated as an engineer from Rennselaer Polytechnic Institute and took graduate work at Brown University.

Circle Wire & Cable Appoints Vice President

S. Manuel Pearl has been appointed sales vice president of **Circle Wire & Cable Corp.,** it was announced by **Milton S. Cohn,** president of the company. Mr. Pearl succeeds in the position of the late **Harry W. Goodman** who died recently.

* * *

Circle, a subsidiary of **Cerro de Pasco Corporation,** produces a wide range of copper wire and cable and related products for the electrical and building industries at its plants at Maspeth and Hicksville, Long Island. Cerro, the parent company, is a leading producer and fabricator of non-ferrous metals.

* * *

Mr. Pearl has been associated with Circle Wire & Cable Corp. for the past five years in the capacity of sales manager. Before that, he was most recently general manager of the electrical products division of International Rolling Mills Products Company of Chicago and, except for service as an Army ordnance officer during World War II, he has been associated with the electrical supplies industries during his entire working life. He was one of the pioneers in the manufacture of fluorescent lighting equipment and formed the Work-O-Lite Company of Newark, N. J., for its production.

Engineer Joins Ransohoff

John R. Strom, formerly chemist and process engineer for the Roto-Finish Co., Kalamazoo, Mich., has been appointed to the newly created post of Technical Director of the **Ransohoff Company,** Hamilton, Ohio. Both the Roto-Finish and Ransohoff companies are under the same management.

* * *

For the past year, Mr. Strom has had charge of the development of finishing compounds and metal cleaners for the two companies.

* * *

Before joining Roto-Finish in 1958, he was a process engineer for Brown-Lipe-Chapin Div. of General Motors, and plating superintendent for the Eljer Company of Marysville, Ohio. He holds a chemical engineering degree from Baldwin College in 1951.

Get the habit of reading

regularly

WIRE AND WIRE PRODUCTS

The Wire Man's Magazine

EXECUTIVE REPORT '60

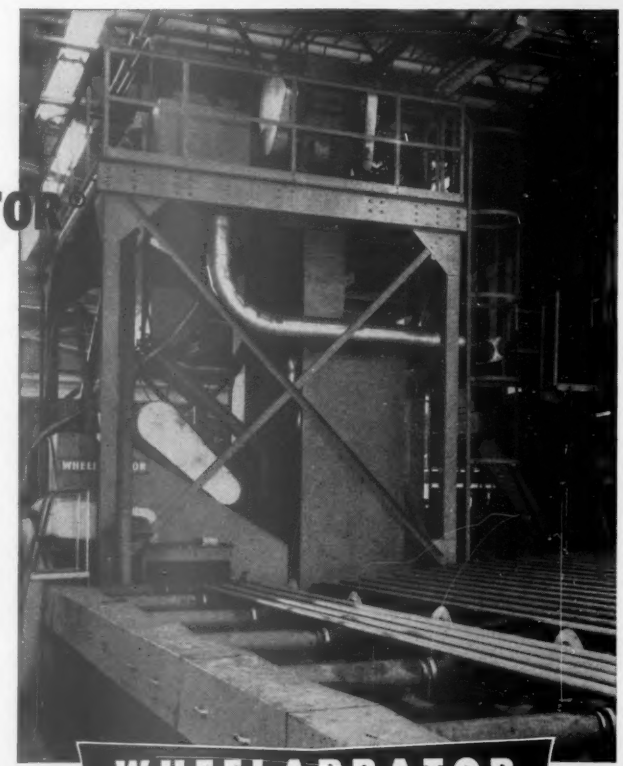
AUTOMATED DESCALING WITH THE WHEELABRATOR

The bar stock cleaning line in the new two million dollar Elyria, Ohio, Cold Draw plant of The Western Automatic Machine Screw Co., Div. of Standard Screw Co. utilizes one of six Wheelabrator descaling machines that have completely eliminated pickling in this modern plant.

On the bar line, the Wheelabrator enables one man to handle the entire operation, from receipt of bar bundles, through an unscrambler, transfer to feed roll conveyors, through the Wheelabrator, and out onto a storage rack in line with the draw bench. For over 16 months of operation, round, square and hex bar stock, up to 4½" diameter in 15' to 45' lengths, has been descaled without any of the old acid pickling headaches. In addition, Western Automatic reports that Wheelabrator descaling provides a definitely superior product for subsequent cold drawing.

How To Automate Your Bar and Wire Drawing Lines

Details of Wheelabrator's cost-saving descaling method are illustrated in Bulletin 148-D. Write to Wheelabrator Corp., 389 S. Byrkit St., Mishawaka, Indiana. In Canada, P.O. Box 490, Scarborough, Ontario.



WHEELABRATOR

AIRLESS BLAST EQUIPMENT

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50c for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,947,069, ALUMINUM CLAD COPPER WIRE AND PROCESS FOR MAKING THE SAME, patented August 2, 1960 by Charles L. Carlson, Irwin, and Stanley A. Rosecrans, Pittsburgh, Pa., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania.

About the copper wire core is a continuous barrier layer of silver of an average thickness of at least 0.0001 inch applied to and bonded to the surface of the copper core, and a relatively thin sheath of aluminum covering and bonded to the layer of silver, this aluminum comprising from 5% to 20% of the cross-sectional area of the wire, the composite structure of copper core, layer of silver and the sheath of aluminum having been subjected to a high reduction in area to metallurgically bond them together.

* * *

No. 2,947,201, DEVICE FOR WIRE DRAWING MACHINES, ROLLING MILLS, ETC., patented August 2, 1960 by Birger David Sigvard Lofberg, 29 Hantverkargatan, Motala, Sweden.

When the wire is treated in the machine, the speed ratios of the different drawing drums, etc. are determined by the elongation of the drawn wire at the respective drawing drums, etc.

* * *

No. 2,947,427, ARMATURE WINDING AND TRANSFER MACHINE, patented August 2, 1960 by Harry W. Moore, 420 Davis Ave., Dayton 3, Ohio.

Special means is provided for automatically removing the armature from the chuck after it is wound, the wound armature being retained in spaced relation from the chuck while a subsequent armature is inserted.

* * *

No. 2,947,488, AUTOMATIC COIL WINDING MACHINE, patented August 2, 1960 by Francis D. Trotta, Utica, New York, assignor to General Electric Company, a corporation of New York.

The machine is said to be adapted for winding the coil to a predetermined valve of inductance by measuring the inductance in the coil during winding.

* * *

No. 2,947,494, APPARATUS FOR PAYING OUT AND WINDING IN CABLES, WIRES, ROPES AND THE LIKE, patented August 2, 1960 by Henry Edward Merritt, Claverdon, England, assignor to Wharton Engineers (Elstree) Limited, Elstree, England.

More specifically, the apparatus is disposed between the cable supplying or receiving drum and the source of tension exerted on the cable so as to control the tension in the cable between the apparatus and the source of tension.

* * *

No. 2,947,652, ELECTRIC CABLES, patented August 2, 1960 by Harvey Burr, London, England, assignor to International Standard Electric Corporation, New York, N.Y., a corporation of Delaware.

This patent is related to Patent 2,810,-011. An object of the present patent is to simultaneously insulate two wires of a pair in order to form a compact pair useful in multi-conductor telephone-type cables.

* * *

No. 2,948,020, METHOD OF MAKING HIGH FREQUENCY CABLE, patented August 9, 1960 by Ralph G. D'Ascoli, Yonkers, N.Y., assignor to Anaconda Wire and Cable Company, a corporation of Delaware.

The method comprises extruding a mixture of polyethylene, a dark-colored pigment and a blowing agent as an insulating layer about a wire, heating the entire mass of this layer to above the decomposition temperature of the blowing agent but below the fusion temperature of the polyethylene, whereby a porous, cellular structure is imparted thereto, exposing the resulting cellular insulation layer on the wire to a source of radiant heat from electrical resistance heating elements maintained at a temperature above the melting temperature of the polyethylene, and holding the wire thus exposed until polyethylene within

FOR THE FINEST IN

METAL PICKLING COMPOUNDS

SPECIFY

PARKIN PRODUCTS

SUMFOAM pickling compound

NEP acid inhibitor

NEPTUNE accelerator

PARKIN CHEMICAL COMPANY

Highland Building
Pittsburgh 6, Penn.

the surface portion of the layer fuses to a dense, non-porous glossy smooth protective outer skin on cellular insulation layer.

* * *

No. 2,949,135, FABRIC MAKING MACHINE, patented August 16, 1960 by William L. Hanna, Foxboro, Mass., assignor to Bugbee and Niles Co., Plainville, Mass., a corporation of Massachusetts.

Connector elements, adapted to be clipped to the fabric as joining means are formed by the machine and placed in position at one station thereof and chipped to the fabric at another station. There are fifteen claims.

* * *

No. 2,949,136, APPARATUS FOR THE AUTOMATIC PRODUCTION OF CLOSED LOOPS OF WIRE FROM WIRE STOCK, patented August 16, 1960 by Horace Walter White, Kidderminster, England, assignor to The National Standard Company Limited, Kidderminster, England, a British company.

The loop-former is in the nature of a drum receptive of a wire stock, and when the loop is formed, the latter is severed from the wire supply, the end portions deformed and a sleeve slipped over the deformed end portions.

* * *

No. 2,949,249, WINDING AND UNWINDING CONTROLS, patented August 16, 1960 by Paul R. Gravenstreter, Willowick, and Leslie A. Koenig, Cleveland, Ohio, assignors to The Clark Controller Company, Cleveland, Ohio, a corporation of Ohio.

An electrical control for maintaining constant tension in a strip that is being wound on a reel and that comes to the reel at constant linear speed is disclosed and claimed in twenty-three claims.

* * *

No. 2,949,250, WIRE COILING APPARATUS, patented August 16, 1960 by Walter J. Manson, South Bend, Ind., assignor to National-Standard Company, Niles, Mich., a corporation of Delaware.

This is a device for treating wire while being continuously fed and supported in the form of a rotating helix with a horizontal axis and includes a freely rotatable wire coil collecting device which is rotatable by the wire thereof.

* * *

No. 2,949,252, WIRE STORAGE AND PAY OUT DEVICE, patented August 16, 1960 by Marvin A. Schumann, Carrington, and Alvin C. Du Vall, Bottineau, N. Dak.

A tiltable-reel wire holding and pay out device is disclosed which includes two telescoping sleeves with a shaft carried by the outer sleeve supporting a pair of reels, and with rotary adjustment of the sleeves in order to tilt the reels.

* * *

No. 2,949, 554, METHOD OF WINDING A LAP WINDING, patented August 16, 1960 by John M. Biddison, Dayton, Ohio, assignor to Harry W. Moore, Dayton, Ohio.

The method of winding a single layer lap winding in the slots of an armature is disclosed, including the steps of winding adjacent coils in opposite directions, forming commutator connection loops between adjacent coils, severing the loops to form leads adapted to extend from the ends of the coils to the commutator, and reversing the commutator connection leads of alternate coils as a preliminary to making commutator connections.

* * *

No. 2,949,789, HIGH SPEED STATOR WINDING APPARATUS, patented August 23, 1960 by Robert J. Eminger, Kendallville, Ind., assignor to Fort Wayne Tool, Die & Engineering Company, Fort Wayne, Ind., a company of Indiana.

This is a stator winding apparatus of the type in which a winding head moves relative to a slotted stator in a path sequentially parallel to and transverse to the axis of the stator bore in placing a winding between two angularly separated stator slots.

* * *

No. 2,950,020, BOTTLE CAP, patented August 23, 1960 by Richard L. Mathies, R. A. 36253790, Ward 44, Walter Reed Army Hospital, Washington 12, D.C.

Lock means for this replaceable bottle cap comprises a pair of normally parallel resilient wire legs connected together at one end only by a central bight portion and being free at the opposite end, with spot welds integrally connecting the mid portions of the wire legs to circumferentially spaced apart portions of a cylindrical cap member.

* * *

No. 2,950.070, CAPACITOR WINDER, patented August 23, 1960 by John R. Thorson, Alexandria, and James G. Black, Jr., and Charles C. Rayburn, Falls

the latest HIGH SPEED
TUBULAR STRANDING MACHINE
from HANSON & EDWARDS . . .

. . . for the cable and wire rope industries.

* External wire guides increase efficiency—reduce "down-time"—provide quick, easy threading.
* Overall dimensions reduced—increased speed.
* Electro-mechanical or electrically operated air brakes to choice.
* Rotor runs in large split roller bearings.
* Direct gear-driven capstan gives positive lays.

19-12½ bobbin machine, one of the new models now in production. The capstan unit, with cantilever mounted haul-off sheaves, is a complete separate unit coupled by shaft and flexible coupling to the main machine.

HANSON & EDWARDS LTD
WARRINGTON ENGLAND

SALES ORGANISATION:
JAMES DAY (MACHINERY) LTD 28 MADDOX STREET LONDON W1

U.S. AGENTS:
THE EDMANDS COMPANY 860 WELLINGTON AVENUE CRANSTON 10, R.I.

P5078

Church, Virginia, assignors, by mesne assignments, to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

There are twenty-two claims in this patent for winding capacitor coils from foil and dielectric tapes and which tapes are clamped in the grooves of a gathering wheel by a tape gathering pin of a winding mechanism.

* * *

No. 2,951,109, WIRE-CONNECTOR, patented August 30, 1960 by Emil Wayne Bollmeier, Mendota Heights, and Leo F. Vokaty, New Canada Township, Ramsey County, Minn., assignors to Minnesota Mining and Manufacturing Company, St. Paul, Minn., a corporation of Delaware.

A spring-wire connector suitable for forming a permanent electrical connection between insulated conductors is disclosed and consists of a series of close-wound cylindrical spring-wire helices whose longitudinal axes are parallel and spaced apart, the spring-wire having sufficient strength to cause displacement of insulation from an insulated conductor, and contact between the spring-wire and the conductor, on slidably forcing the insulated conductor along the contacting spring-wire surfaces.

* * *

No. 2,951,111, LEAD WIRE TAPE, patented August 30, 1960 by Edward P. Anderson and Walter F. Doring, Livingston, N. J., assignors, by mesne assignments, to Engelhard Industries, Inc., Newark, N. J., a corporation of Delaware.

For high temperature application, the tape comprises an inelastic open woven fabric base made of glass or quartz fibers, at least one high temperature resistant lead wire, and stitching along the length of wire for loosely securing it to the base in a generally wave-like form, the wire having a length over-lying the fabric which is greater than the fabric base to which it is secured, whereby the expansion and contraction of the wire occurs in a lateral rather than a longitudinal plane.

MEMO

TO CABLE MANUFACTURERS

Need cable filler specialties? Keep these Plymkraft specialties in mind:

- Insulation Braider Cord
- Fungus Resistant Cable Fillers
- Water Resistant Tissue Cable Fillers
- Stranded Polyethylene Cable Fillers
- Poly-Vinyl Chloride Cable Fillers

We will be glad to consult with you on any special cable filler problem. Call or write any office below.

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P.O. Box 10215 New Orleans, La. VErnon 5-7243
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PLYMKRAFT DIVISION

Plymouth Cordage Company, Plymouth, Massachusetts

Manufacturers of Waxed Cable Fillers, SJ Cable Fillers and Range Cable Fillers

PLYMOUTH 1824

Stitching Wire With 200,000 Pound Tensile

An extremely tough high carbon stitching wire has been developed by **Prentiss Wire Mills, Riverside-Alloy Metal Division,** H. K. Porter Co.

* * *

The new hard temper bookbinders wire, designated as Grade XXX, has a tensile strength of 200,000 to 240,000 pounds psi. The wire can be used on heavy duty stitching machines and has been considered ideal for stitching hard cover textbooks and extremely thick catalogs.

* * *

Previously, Prentiss produced Grade XX Bookbinders Wire, with a tensile strength of 180,000 to 200,000 pounds, in addition to the standard temper wire. Prentiss has been a leading producer of bookbinders wire ever since introducing that product in the United States in 1876.

Steel Industry Organizes To Participate in International Standards Work

For some years American participation in the work of Technical Committee 17 on Steel of the ISO (International Organization for Standardization) has been on an observer status. After a series of discussions in 1960 between the **American Standards Association** (which officially represents the USA in the ISO), the **American Iron and Steel Institute** and the **American Society for Testing Materials,** an American Supervisory Group was appointed to participate actively in the work of ISO/TC 17.

* * *

A nine-man group consists of representatives of four steel producers and four steel consumers with a member of the ASTM staff acting as secretary. **C. L. Kent, Jones and Laughlin Steel Corp.,** has been appointed chairman. Ameri-

can steel producers have established a fund so that the first year or two of work will not be hampered financially.

* * *

The first meeting of the Supervisory Group was held on June 27, 1960. At that time it was decided to gather information on the seven working groups of ISO/TC 17. After such information has been received another meeting will be called to decide if the USA should request membership on any of the existing working groups. The present working groups cover (1) test procedures, (2) classification and designation, (3) structural steel, (4) heat treated and alloyed steels, (5) sampling and general technical conditions of delivery, (6) methods of chemical analysis, and (7) methods of test other than mechanical and chemical analysis.

Light Duty Flexible Shaft Assemblies Catalog

Catalog No. 6094 illustrating light duty flexible shafts and flexible shaft couplings currently manufactured by Kupfrian Manufacturing Corp. has just been released. This latest catalog lists in detail, many types and sizes of standard flexible shafts and couplings ready for installation as well as the more popular component parts such as end fittings, core sizes, casings, etc., required to design special assemblies. Typical core properties are also given for engineering evaluation.

* * *

Included in this catalog are various design techniques which will assist engineers in applying flexible shaft assemblies to their engineering projects.

* * *

This new catalog is available by writing Kupfrian Manufacturing Corp., 129 Prospect Ave., Binghamton, N. Y.

Booklet on Solid Lubricants

The theory and practice of lubrication by solids are the primary subjects in a new booklet published by **The Alpha-Molykote Corporation,** a leading manufacturer of molybdenum disulfide lubricants for industry. The booklet discusses boundary friction and the role of solid lubricants in reducing friction and wear under heavy load and high temperature conditions, and the major advantages of molybdenum disulfide solid lubricants — low coefficient of friction, natural affinity for metal surfaces, and pressure resistance beyond the yield point of any metal.

* * *

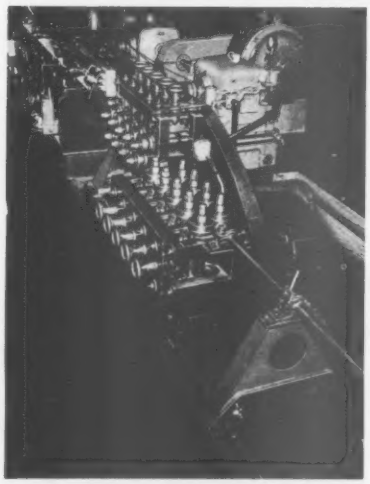
To answer the question of its title "What is Molykote?" the booklet goes on to discuss molybdenum disulfide lubricants, that are available as powders, greases, resin bonded coatings, dispersions, or in a variety of special forms.

* * *

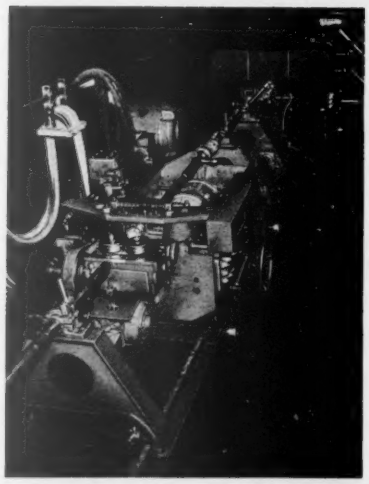
Bulletin 124 is available from The Alpha-Molykote Corporation, 65 Harvard Avenue, Stamford, Conn.

LOMATIC

COMBINED DRAWING STRAIGHTENING CUTOFF AND POLISHING MACHINE



Payoff - Drawbench - Straightener



Flying Shear - Polisher - Discharge

Now available in two standard sizes, the revolutionary LOMATIC machines handle ferrous and non-ferrous rods and tubes at speeds up to 200 ft. per min. and with drawing capacities up to 16,000 lb. Compared to conventional separate rod drawing, straightening, polishing and cutting-to-length operations, the LOMA single-operation fully automatic machine offers the following major advantages:

- Greater output rate — continuous operation at high speed
- Reduced labor cost — only one operator required
- Improved straightness — stock is straightened in two planes
- Perfect concentricity — obtained by straight-line drawing action
- Higher surface finish — due to two-stage polishing unit

The complete line comprises an uncoiler, a pre-straightener, a drawbench, a roller straightener, a flying cutoff, a polishing machine and a discharge table. All components required for the complete sequence of processing operations are interlocked mechanically and electrically into one integrated and synchronized line which is controlled by only one operator.

Our standard line of equipment includes:

- Casting Machines and Molds
- Saws and Cut-off Machinery
- Hot and Cold Rolling Mills
- Rod and Tube Draw Benches
- Roller and Stretcher Levellers
- Air and Hydraulic Tube Testers

LOMA
MACHINE MFG. CO., INC.
114 East 32nd Street
New York 16, N. Y.

New Folder on Strapping Machines

A new folder by **Signode Steel Strapping Company** illustrates the firm's latest M-20 series of electric-powered strapping machines.

* * *

The series combines high flexibility — both in pre-selected tension and in package dimensions — with high packaging speed and minimum operator fatigue. Except when he dials a new tension setting, the operator need only position the package and operate the foot switch.

* * *

The new four-page brochure charts characteristics of each of the four standardized general-purpose machines and of the M20-A for hardwood flooring and the M20-RB for end-binding of paper rolls.

* * *

For a copy of "Signode M-20 Series Standard Power Strapping Machines," write to Signode Steel Strapping Company, 2600 N. Western Ave., Chicago 47, Ill.

New Manual on Insulating Materials Testing Methods and Equipment

A new manual on methods and equipment for testing insulating materials has been compiled by **Associated Research, Inc.**

* * *

Some of the wide range of subjects covered in this new manual are:

High Voltage Breakdown Testing of Insulating Materials in Accord with ASTM Specifications.

Automatic Rate of Rise Control for High Voltage Breakdown Testing of Insulating Materials.

Determining Resistance to Arcing of Insulating Materials.

Testing Insulating Oils for High Voltage Breakdown.

Detection of Corona Leakage in High Voltage Equipment.

High Voltage Breakdown Testing of Power Cables and Bushings.

* * *

A copy of Manual G-65 on insulating materials testing methods and equipment may be secured by writing to Associated Research, Inc., 3777 W. Belmont Ave., Chicago 18, Ill.

* * *

du Pont Appoints Mylar Distributor

Insulation Manufacturers Corporation of Chicago has been appointed a full-line distributor for "Mylar" polyester film, **William B. Davis,** industrial sales manager for du Pont's Film Department, has announced.

* * *

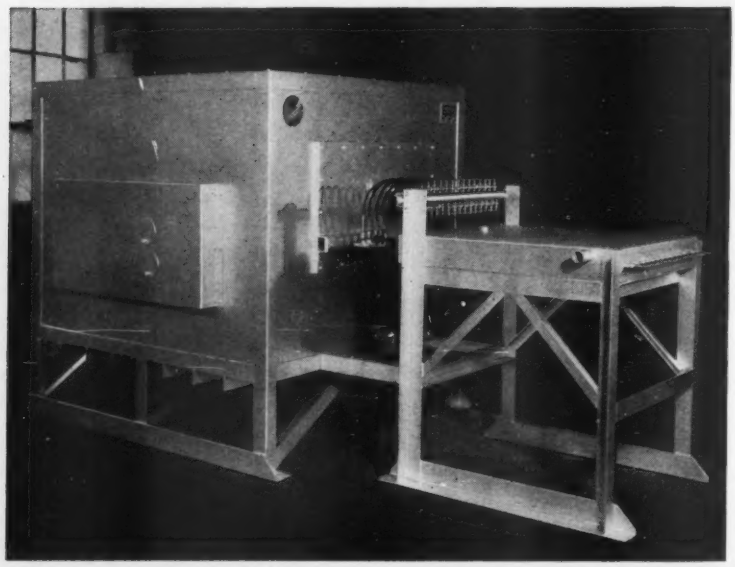
The company, with facilities for precision slitting of films, will both fabricate and distribute the film. Its six district offices and five authorized representatives will expand the distribution system for "Mylar" throughout the Midwest.

* * *

"Mylar" is widely used as an insulation and construction material for wires and cables, motors and generators, capacitors, and transformers.

HARPER STRAND ANNEALER

delivers bright stainless wire continuously at high speeds



Operating at temperatures from 2000°F. to 2200°F., this 30 tube Harper Electric Strand Annealing Furnace turns out Type 304SS wire bright and clean. Sizes from .02″ to .0014″ are passed through its 40″ hot zone at rates up to 100 FPM per tube.

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Harper manufactures a full line of automatic conveyor, continuous tube, and bell type annealing furnaces for billets, bars, rods and wire. To solve your wire problem most profitably, call in a Harper engineer or write: Harper Electric Furnace Corporation, 42 River St., Buffalo 2, N.Y

HARPER

ELECTRIC FURNACES

Some Notes on Heat Treating Wire and the Equipment Therefor

(*Continued from page* 1378)

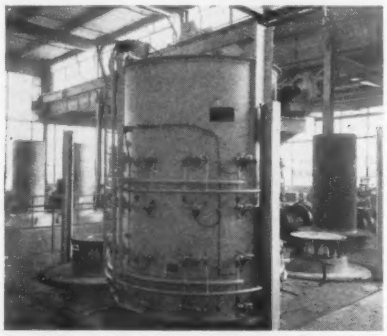

Figure VII. — American gas fired cover type furnace. * * * * * * *

United States are fired with natural gas and provided with alloy tubes surrounding the wire. The tubes are filled with protecting, inert gas, which eliminates scaling. The wires being processed may be cooled in the protecting tubes, or in a lead bath to control the minimum temperature, and give the results of a delayed quench. The lead bath also protects the wire from oxidation until cooled.

Note that the surface condition (emissivity) of the wire has a marked effect on the rate of heating and cooling. Assumptions made herein are based on a bright wire surface; a dull surface will heat more rapidly.

* * *

In England, where fuel gas is not readily available, most furnaces are electrically heated.

Batch Type Annealing Furnaces

Considering how the batch type of furnaces for annealing wire, two basic types are commonly employed—the bell type, Figure VIII and the pit type, Figure IX. Of these, the gas fired bell type is most widely used in the U.S.A. where fuel gas is cheap and available, while in England (and in Europe generally) electrically heated bell or pit furnaces are both used extensively.

* * *

The bell type furnace (See Figure X) consists of one cylindrical heating cover, and two to four bases, with an alloy protecting in-

Figure VIII. — Modern installation of English pot furnaces. Courtesy of Efco Ltd., Weybridge, England. * * * * * *

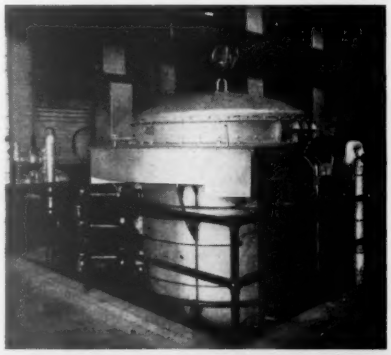

Figure IX. — Pot-Type, gas fired furnace, work carried in baskets. Serviced by shop crane. * * * * * * * *

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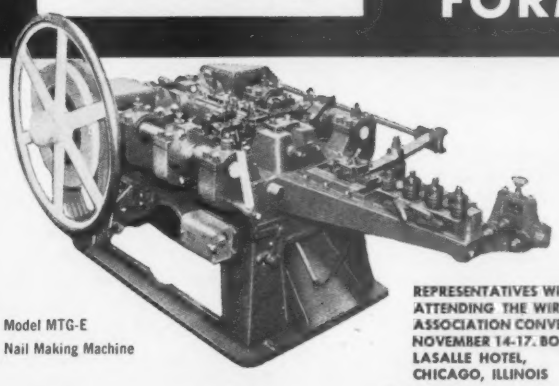

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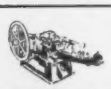

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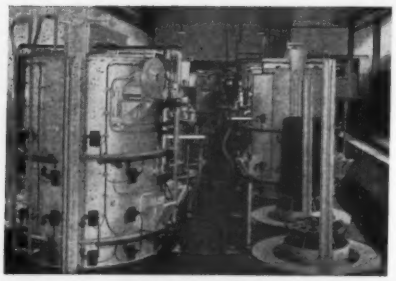

Figure X. — American bell-type furnace.

ner cover for each base. The coils of wire are stacked on the base, after which the inner cover is put in place. The heating cover is then placed over the inner cover and after purging the charge of wire coils is brought up to annealing temperature, while subjecting the load of wire to a violent stream of hot inert atmosphere. Figure XI represents good American practice, while Figure XII shows the results of water cooling the inner container.

* * *

The bell type furnace offers maximum flexibility of temperature-time cycle, with any desired gas atmosphere. Incidentally, the bell type furnace is very economical of atmosphere. After a thorough purge, the atmosphere requirement is only that required to make up losses; a purge cycle of 30 minutes is normally satisfactory.

* * *

The bell furnaces are provided with a powerful fan in the base so that heating may take place both by convection and by radiation, thus substantially reducing the heating time and increasing the output.

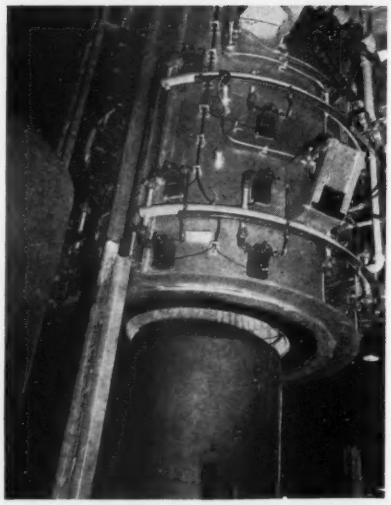

Figure XI. — Top hat (bell-type) furnace, outer cover raised to show construction.

* * *

The furnace labor is primarily that required to load and unload the base, as no labor is involved while the furnace is heating or cooling, and since a cycle is usually eight hours or more, the actual labor is quite small.

* * *

The working space on each base is about 40″ diameter and 60″ high. The operating temperature is about 1400°F. Under these conditions the group will process over 100 tons per week (each load weighs about one ton). The floor space required for this production is approximately 1500 square feet. Each base fan will require about 15 HP.

* * *

Where maximum production per square foot of floor space is demanded, it is possible to put a central heating element in the inner and outer covers, so that the load is heated both from the center outward, and from the outer surface inwardly. This results in an increase in production of about 20% per unit.

* * *

The general performance of a load of copper wire in a bell type furnace is given below. With a possible power input of 120 KW and furnace dimensions of 36″ diam-

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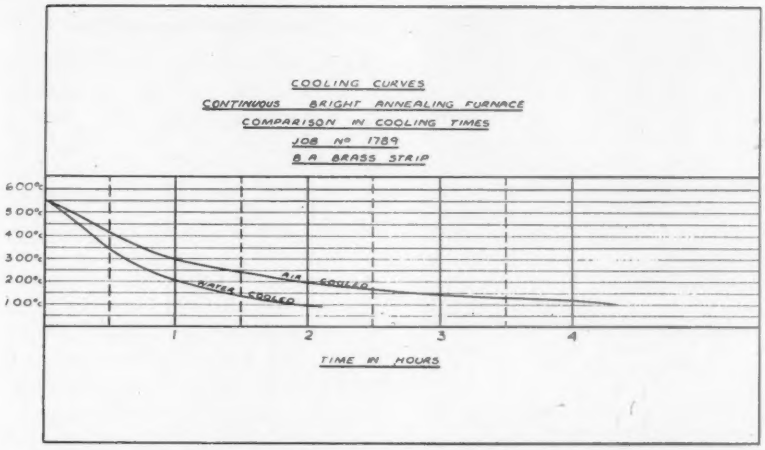


Figure XII. — Curve showing effect of water cooling of inner hood. * * * *

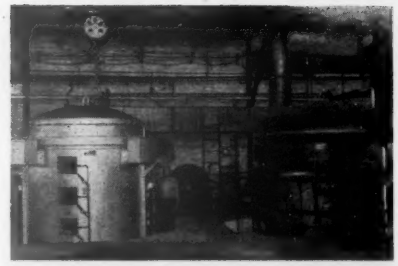


Figure XV. — Pot-type furnace with removable cover. * * * * * * *

well as the available head room of the building.

* * *

In order to utilize the bell furnace at maximum capacity, it is good practice to provide a simple

eter x 54" high, the production of annealed copper wire coils would be around 2500# per hour (using two covers, and six bases).

* * *

When using the same furnace equipment on steel wire in coils, the production would be 2000# per hour. See Figure XIII and Figure XIV.

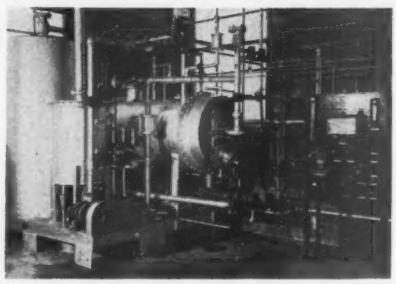


Figure XIII. — Inert atmosphere generator. Rich exothermic. * * * * * *

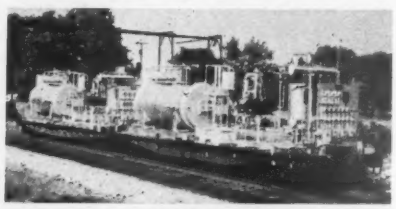
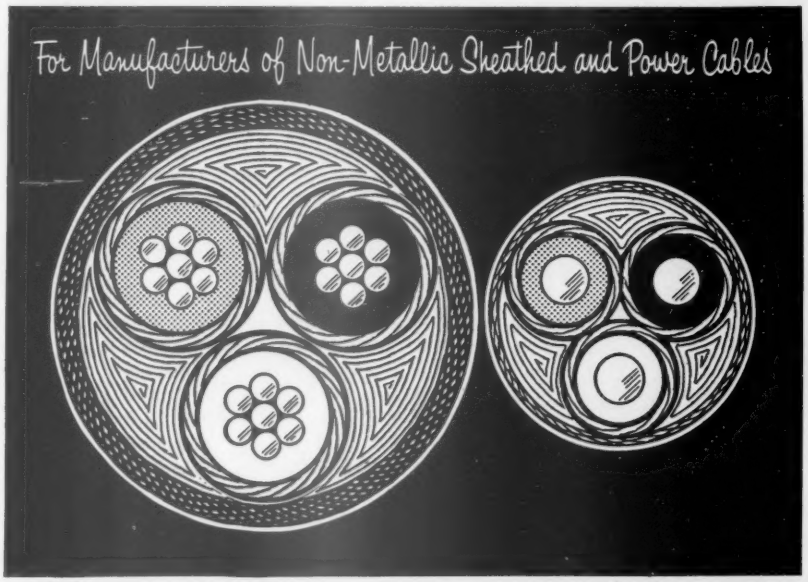


Figure XIV. — Two large inert gas generators; capacity 60,000 C.F.H. each. * *

The purging time would be about 30 minutes in both cases and the normal cooling time 8 to 10 hours. The heating time of a load of 6000 lbs. of steel (with furnace and bases hot) would be about 4 to 5 hours, (See Figure XV) with twice this figure for cooling. Also see diagram Figure VII.

* * *

In planning an installation of bell furnaces, the capacity of the lifting crane should be checked, as



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elevator to load a tray or fixture and place it on the empty base while waiting for the heating cover to complete its cycle.

Protective Gas Generator

The selection of the proper type (See Figure XVI) and Figure XB) of gas generator is controlled by the nature of the work being heated, and the results that are desired. For the annealing of low or medium carbon steel, a rich exothermic atmosphere is satisfactory. If this atmosphere is thoroughly cracked and dried, it is very satisfactory for medium carbon steel.

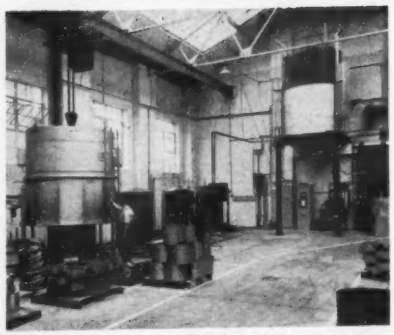

Figure XVI. — Typical English cover-type furnace. Courtesy of Efco Ltd., Weybridge, England.

* * * * * * *

Inert Gas Generators

Protective atmospheres are available using fuel gas or ammonia, depending upon the service required and the economics involved. Inert generators using fuel gas may be divided into exothermic and endothermic types.

* * *

Dried exothermic atmospheres are used successfully for bright annealing copper and most copper alloys, and for medium and low carbon (0.5) steel. A typical composition of a rich exothermic atmosphere made from methane is shown below.

RICH EXOTHERMIC ATMOSPHERE	
CO_2	4.0
H_2	18.0
CO	12.0
CH_4	1.0
H_2O	0.1
N_2	Balance
Dew Point	+20°F.

* * *

It may be of passing interest to note that an inert gas of this type, (using methane as a base) costs around 10¢ per 1000 cubic feet in most locations. In the U.S.A., an endothermic gas with a controlled dew point is generally used for bright annealing of high carbon steel and (with the addition of a few percent raw methane) for carburizing and nitriding. Furnace temperatures for carburizing are ordinarily 1700°F or somewhat higher. The higher the furnace temperature, the shorter will be the required time cycle.

* * *

The composition of a typical endothermic atmosphere is shown below. The cost is around 25¢ per 1000.

COMPONENTS	%
CO_2	0
CO	21
H_2	40
CH_4	1
N_2	38
O_2	0
Dew Point	−40°F.

* * *

For annealing high carbon steel wire or for recarburizing wire which has been "decarbed" in process, an endothermic atmosphere can be made available, while for close control, an atmosphere of cracked ammonia will also give excellent results. The ammonia may be completely cracked, or largely burned and partially cracked. Thus,

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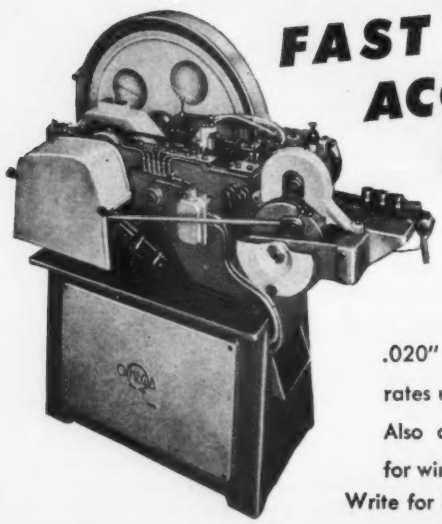

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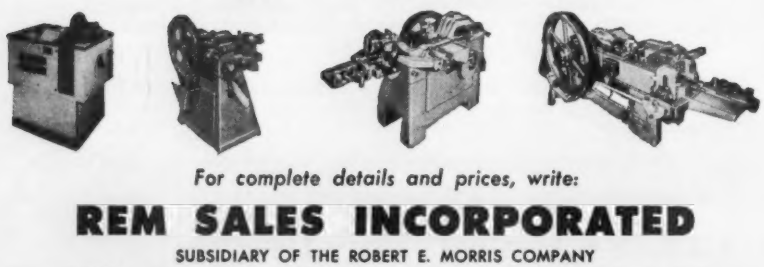

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after drying, the burned ammonia will give several times as much available nitrogen as in the case of the cracked ammonia. If the burning process is used all water must be completely removed. Since most atmospheres are usually mixed in the furnace with some traces of oxygen (from leakage of air), the presence of small amounts of hydrogen in the inert gas is not objectionable, as it combines with and neutralizes the leakage of oxygen (air). This result can readily be obtained by controlling the relative portion of ammonia cracked and the amount burned. As is well known, too much hydrogen will tend to make the metal brittle, due to the formation and absorption of hydrogen compounds. Other materials may be used as a source of gas atmosphere, as fuel oil, propane, butane, and even clean, dry charcoal. However natural gas is very much the best raw source.

Pot Type Furnace

Closely related to the bell furnace is the pot type furnace, in which the fan is in the roof, and the entire furnace is frequently placed in a pit, (to conserve head room in the building). This furnace, with electric heat, is widely used in England, but to a less extent in the U.S.A., where it is replaced by the bell furnace.

* * *

A typical pot type furnace is rated at 175 KW per furnace, with useable pot dimensions of 30″ diameter by 90″ high. The operating temperature is 1130°F with a production of 3000 lbs. on carbon steel wire.

Miscellaneous Notes

A copper wire alloy containing about 2% beryllium and 2% nickel becomes very hard when slowly cooled. To make beryllium wire workable, it must be quenched from around 1200°F; when reheated slowly, the wire will have a strength approaching high carbon steel. A catenary wire annealer is shown in Figure XVII.

* * *

One application which must not be overlooked, is the provision for lubricating means prior to cold drawing steel. The commonly used lubricant is a slurry of lime into which the steel coils are dipped and quickly dried. Care must be taken to keep carbon dioxide from contact with the lime slurry, as it will combine, forming a gritty coating (calcium carbonate) which will cause excessive die wear.

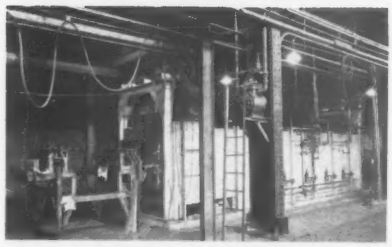


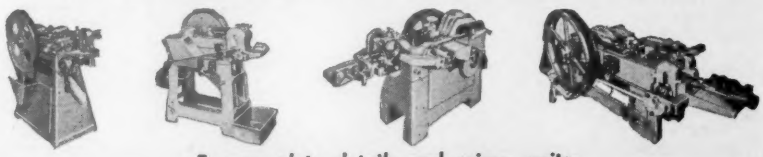
Figure XVII. — Continuous catenary annealer, American practice.

* * *

Drying is most satisfactory when quickly accomplished by the rapid circulation of a large volume of clean hot air. In some cases where a large reduction and rapid drawing is required, the wire is given a preliminary dip in copper sulphate immediately before liming. In this case, the thin layer of metallic copper is an effective lubricant, and lengthens die life.

The new Morris-Omega "00" SDDS Cold Header forms parts from wire down to .012" diameter in lengths as short as .016" — and at production rates as high as 150 per minute!

The Model "00" is only one of a series of precision heading machines, which includes a special open die type that will head parts up to 2⅜" in length on wire sizes from .020" to .090".



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In most cases of wire drawing, the outer or surface layer receives a degree of cold working and thus of hardening greater than the interior. As a result, the overall strength of the wire is increased from the strength of the raw metal.

* * *

This principle has been carried to its logical conclusion and the Armour Research Laboratory has announced the production of super fine, super strong metal fibers with a strength may times that of high carbon steel. If these strands could be combined into a cable or rod, some very interesting products would result.

* * *

The applications of heat to wire, are indeed innumerable, ranging from the development of "temper" colors on "Bobby pins" and safety razor blades, to operations involving well over 2000°F in the case of some of the more refractory alloys, or forgings.

* * *

This brief discussion is an attempt to outline only a few of the more interesting applications.

* * *

Of all the numerous forms into which the metals are converted, wire is probably one of the most useful.

* * *

The art of making and processing wire to make it serve its manifold applications is well-known as a practical procedure, although some of the theories may be somewhat obscure. Today's procedures foretell new and interesting developments, which the future partially conceals.

ACKNOWLEDGEMENT:

The writer is indebted to the Electric Resistance Furnace Company of England for the photographs of British furnaces and notes on European practice.

Heavy-Duty Twinwheel Wire Stripper Removes Film Type Or Bonded Insulation

The Carpenter Model 12 Twinwheel Wire Stripper is a new power driven wire stripping machine especially designed for the removal of Enamel, Formvar, Nylon, Cerox, Glass, Teflon and other film and bonded type insulations or combinations of these insulations. It handles sizes from 17 to 45 AWG — either single or stranded electrical conductors, without damage to the wire. Its cost is $175.00.

* * *

A Dust Collector Unit is also available for this model. This is a separately mounted unit with a separate motor drive. The Dust Collector is connected to the Trash Box of the Model 12 with a flexible hose. Price: $50.00.

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Introduces Crest-Nuts To Its Product Line

Crest Products, Inc., Union, New Jersey, announces that it is currently manufacturing a new line of Crest-Nuts. Made of heat treated spring steel, Crest-Nut dimensions are — 1/8"-27 NPS, hex width 9/16", washer diameter 7/8". They are produced by highly automated equipment, resulting in a low cost, quality product.

* * *

Crest-Nuts are available cadmium plated, nickel plated, black phosphate and plain.

* * *

For further information, engineering assistance and samples, inquiries should be addressed to Crest Products, Inc., P. O. Box 64, Union, N. J.

SIC Announces Election of Officers and New Products

Standard Industrial Compounds Co., Frankfort, Ill., at its annual meeting elected the following officers:

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Vice President—Earl A. Bowers, Jr.
Treasurer—Bruce W. Siemon
Secretary—Wallace G. Solum

* * *

It was also announced that the company, a leading manufacturer of wire drawing lubricants, has completed the construction of additional facilities adjacent to its present plant.

* * *

Arrangements to merchandise Standard's new series of Electronic Oils throughout the North American continent have been completed and put into effect.

* * *

Additional new Synthetic Coating products have been added to the line to solve the "have-your-cake-and-eat-it" problem of outside storage and compact bundles of non-tacky, ductile film for the protection of wire. Exhaustive mill tests have field-proven the outstanding qualities of these new adjuncts of the Synthetic Coating Line.

Portable Wire Stitching Machine

A new, portable Wire Stitching machine which makes and inserts staples from a coil of wire, has been developed for fastening materials up to 3/8" thickness. This machine can "staple" through low-

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A HYDRAULIC SYSTEM OF FOOL-PROOF DESIGN! One-hose design cuts replacement costs in half. Adjustable relief valve saves wear and tear by providing the correct pressure for any cutting job. Hydraulic oil is filtered by an easy-to-change 40 micron oil filter. And a safe 12-volt control switch on the cutterhead gives instant finger-tip control of the cutting action.

WRITE FOR ON-THE-JOB DEMONSTRATION OR ROD AND BAR CUTTER CATALOG

AVAILABLE NOW! 3 CUTTERHEADS with capacities up to 1 3/8" steel rods. 5 HYDRAULIC POWER UNITS. Matched to your exact requirements. Specially designed heads for other non-cutting applications, such as punching, crimping, heading, forming.

H. K. PORTER, INC.,
Somerville 43, Mass.

carbon steel, aluminum, plastics, wood, and paper. The five pound coil of wire will make approximately 60,000 staples before reloading. The staple cost is between 3 and 5 cents per thousand, depending on wire size.

* * *

The machine can be actuated by either a foot switch or a microswitch and is available with single-trip or multiple-trip clutch. The wire used is stocked in 28 different gauges of both round and flat, in standard finishes and colors.

* * *

For additional information and specifications, send for Bulletin 720, **General Staple Company**, Dept. "W", 28 East 22nd St., New York 10, N. Y.

New Welding Flux Developed For Submerged Arc Welding

A new welding flux that makes possible the use of submerged-arc welding techniques in the construction of submarine hulls promises to lower production costs, welding technologists at **Battelle Memorial Institute** report. Most welding of such steel has been done manually with coated electrodes to assure desired notched toughness.

* * *

High oxygen content and numerous silicate inclusions in submerged arc welds on HY-80 structural steel prepared in shipyards pointed up the need for a new flux, according to **Perry J. Rieppel**, chief of the Metals Joining Division at the research center. Reducing oxygen and the number and size of inclusions improved the welds. Studying a number of experimental fluxes, they developed one that gave excellent welds. This flux is less acid than ones now in use, because it contains relatively little silica and an exceptionally large amount of calcium oxide.

* * *

Using the new flux and commercial wire, Battelle technologists made welds with a yield strength of about 90,000 psi, ultimate strength of 100,000 psi, excellent tensile ductility, and notch impact values of 30 foot-pounds at –100 F. Prior to the development of this flux, welds with comparable yield and ultimate strengths had values of only 10 to 15 foot-pounds at –100 F. Equally striking improvement has been obtained in the notch bar behavior at room temperature.

* * *

Plans call for evaluation of the flux under semi-production conditions in the near future. In the meantime, studies are under way to determine why the experimental flux provides better welds.

New Abrasive Announced

A radically new aluminum oxide abrasive, developed especially for stainless steel billet and slab grinding, has been introduced by **Norton Company**. It will be known as 75 Alundum abrasive, appropriately named because of its introduction during the Company's 75th anniversary year.

* * *

According to **Robert Cushman**,

CARLO SALVI
MILAN — ITALY
MECHANICAL ROD DESCALERS FOR
LOW, HIGH CARBON, ALLOYED AND STAINLESS STEEL
Models for Rods to over ¾" diameter
Do away with acid pickling
Remove scale completely
Produce bright surface
Have large forced lubrication box and watercooled drawing die holder
SOLE U.S. REPRESENTATIVE
Straus-Artys Corp.
FOR FURTHER DETAILS WRITE TO:
45 NO. STATION PLAZA GREAT NECK, N. Y. HUnter 2-4514

general sales manager of the Company's Abrasive Division, 75 Alundum abrasive promises to be the greatest single contribution ever made to grinding wheels used for stainless steel billet and slab grinding.

* * *

This new abrasive was developed in Norton's Research and Development Department at Worcester, Mass., by a team of research men headed by **Dr. Herbert F. G. Ueltz** and **John K. Sjogren.** Applications for patents are pending.

Bulletin On Heat Treating Furnaces

"The Facts on the New Ipsen Heat Treating Units" is the title of a new 6-page technical bulletin just published by **Ipsen Industries, Inc.,** Rockford, Illinois, manufacturers of industrial heat treating units and related equipment.

* * *

Eleven cross-section drawings, photographs and tables give detailed construction and performance facts on the equipment which operates at temperatures up to 2000° F. The units are designed for carburizing, carbon restoration, carbonitriding, neutral hardening, marquenching, normalizing, annealing and brazing.

* * *

Tables give dimensions, maximum heat input, net heating rate, maximum load at 2000° F, and approximate shipping weights for both single zone and double zone heat treating units.

* * *

Copies of Bulletin T-19-C are available on request to Ipsen Industries, Inc., 721 South Main Street, Rockford, Illinois.

Tensolite Appoints Representative

Tensolite Insulated Wire Co., Inc., Tarrytown, N.Y., recently named **C.F.L. Corporation** as its regional representative in Colorado, Wyoming, Utah, New Mexico, western Nebraska, southern Idaho, and El Paso County, Texas.

* * *

The firm, located at 1871 S. Broadway, Denver, will handle all sales of Tensolite's high temperature insulated wire and cable products in the territory. **Gene Nye,** president of C.F.L., has had many years of sales engineering experience with insulated wire and cable.

New Catalog on Fluxes, Solders, Soldering Supplies

New Catalog C-1 contains complete descriptions of fluxes, solders and supplies for all soldering applications. Products shown include general purpose, stainless steel, aluminum, rosin and non-corrosive fluxes, paste solders, tinning compounds; silver brazing fluxes; aluminum and stainless steel solders; soldering accessories. Available from **Johnson Mfg. Co., Inc.,** Mt. Vernon, Iowa.

TO SELL — ADVERTISE IN
WIRE AND WIRE PRODUCTS
It pays — send for rates
453 Main St., Stamford, Conn.

The PESCHEL line

ELECTRICAL TEST EQUIPMENT FOR THE Wire Industry

Low Cost - High Quality Sparker

Now - GUARANTEED FOR 5 YEARS

Model S14CV — AC/DC

FEATURES: RUGGED CONSTRUCTION WITH LONG LIFE SELENIUM RECTIFIERS • ACCURATE AT ANY SPEED • DC OR AC OUTPUT • FOR USE ON EXTRUDER OR RESPOOLER. ANY SPEED • 400 FPM WITH 1" ELECTRODE (2400 FPM WITH 6" ELECTRODE) • RELIABLE OPERATION DOWN TO 5% OF MAXIMUM OUTPUT VOLTAGE • SIMPLE TO OPERATE BY INEXPERIENCED PERSONNEL.

FOR BEST VALUE — SPECIFY PESCHEL SPARKERS

PWE PESCHEL ELECTRONICS, INC.

TOWNERS, NEW YORK (Putnam County) Tel: TRinity 8-3251

Stationary Block Drawing and Handling of Wire

(*Continued from page* 1360)

proper study of all jobs and equipment where savings can be made. Stems and creels for this use should be uniformly designed to be useful at several operations. Alloy stems or properly designed steel stems can be used for heat treating operations and greatly increase the capacity of such equipment. The use of this type of handling enhances the combining of operations, such as cleaning, coating, rolling, heat treating, etc. in a direct line, as more man time is available to perform additional operations.

* * *

When we list the assets of the dead block system we find that larger packages, continuous operation, (no coil stripping) and package removal without interrupting the production process indicate a reduced operator work load in comparison to the conventional method. While the operator can exercise immediate quality control of off size wire and directly correct the causes, the larger packages make more time available to operate additional machines. Therefore, an operator can operate more machines with the same work load. The proper application of Industrial Engineering practice indicates that dead blocks must be applied in groups to achieve the maximum economies resulting from a change in operator work load. The total result gives increased machine efficiency, more production per man hour and we have immediate quality control and can have any desirable package size for extra plant handling or final shipping.

* * *

Proper Industrial Engineering application also indicates that there are hazards to mixing experimental operation and training of operators in the production operation.

* * *

When dead blocks are incorporated into the production system some disadvantages are to be noted.

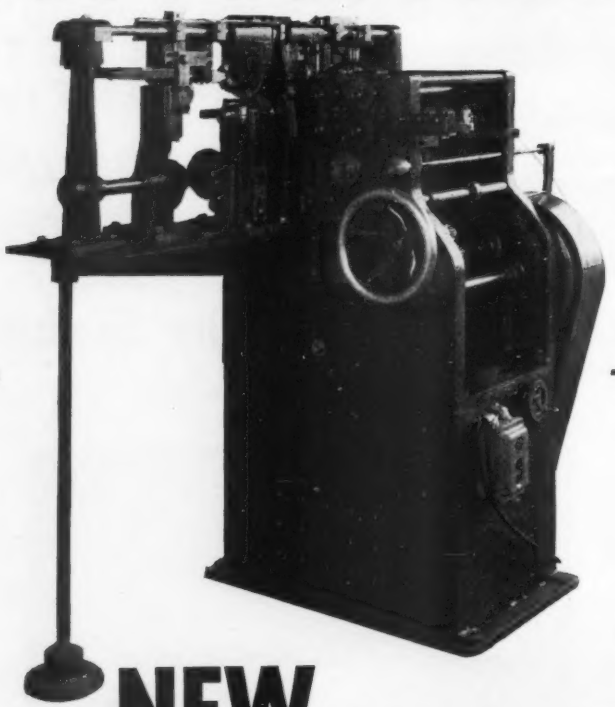
1. **Large continuous coils can be a hindrance to wire cleaning. Usually where coils must be split for any reason, much of the advantage is lost.**
2. **Certain types of Annealing could require split coils.**
3. **Some consideration should be given to the rotating of the machine with respect to the coil and the ultimate method in which the coil is used. In some cases it is preferable to use the dead block with a final wire drawing die, in other cases the casting reel type is better.**

* * *

Dead blocks are not a guaranteed cure for all ailments. The proper application of Industrial Engineering principles can result in production increases of 15 to 50% and to achieve maximum efficiencies they must be applied in groups and according to man work loads.

* * *

Summarizing, stationary blocks offer two main advantages; intraplant handling and customer handling advantages. Wire mill management will be most interested in the intraplant advantages.



NEW For Springmakers

AUTOMATIC COILER and LOOPER

WELLS' NEW FULLY AUTOMATIC SPRING COILING AND LOOPING MACHINE coils, trims and loops in sequence. By trimming before looping extremely accurate springs are made. Produces cross-over, machine and side loops, or any combination of these.

Machine shown above handles .025" to .062" diameter wire, forming coils of 3/16" o.d. to 5/8" o.d., 1/2" to 5" long.

Loops on each end can be varied 360° to each other and held to ±3°. Loop openings can be held to ±.010", or less.

Adapted from the WELLS large diameter automatic coiling and looping machines made for several years, this new spring machine will be a boom to manufacturers of mechanical coil springs.

Made By The Producers of the Wells Straightening And Cutting Machines.

Write for information

Frank L. Wells Company

BUILDERS OF FINE WIREWORKING MACHINERY

5821 FIFTH AVENUE • KENOSHA, WISCONSIN

OR — HARVEY SPRING MFG. CO. — 671 N. Sangamon St., Chicago, Ill.

The maximum advantage is obtained when the entire mill is studied from a handling standpoint and each individual unit is designed to fit into the entire plant operation. Standardization of stems to be used is important for flexibility. Many commercial stems and containers with built in stems are available which can be used to advantage within the mill as well as used for shipping containers. A thorough study of the problem within the plant will reveal some amazing economies if properly applied.

The Diamond Mine In Your Die Room

(*Continued from page* 1365)

how much you can save in your own operation, here's a quick way to come up with a figure:

1. **First, multiply your average annual expenditure for diamond by 4. This will allow approximately for the time required to apply the diamond you buy.**
2. **Then, *if* you have reason to suspect the purity or grading accuracy of the diamond you use, credit potential savings with at least ten percent of the total cost of diamond and the time required to apply it.**
3. **Next, *if* the concentrations of diamond applied are only approximately controlled or if 5 or 6 finishing steps are being completed where 3 will perhaps suffice, credit potential savings with at least another ten percent of the total in item 1.**
4. **Finally, *if* you are discarding diamond abrasive refuse, credit potential savings with at least a third of your annual expenditure for diamond.**

* * *

The conditions noted here are prevalent today, and the potential savings estimates are definitely on the conservative side. They prove how easily the total cost of diamond and diamond application can be reduced by at least a fourth on an industry-wide average basis. Can you afford to ignore the "diamond mine in your die room?"

Brochure On Thermocouple Wire

A new brochure, "Noble Metal Thermocouple Wire," has been published by **Baker Platinum Division** of Engelhard Industries, Inc., supplier and fabricator of precious metals.

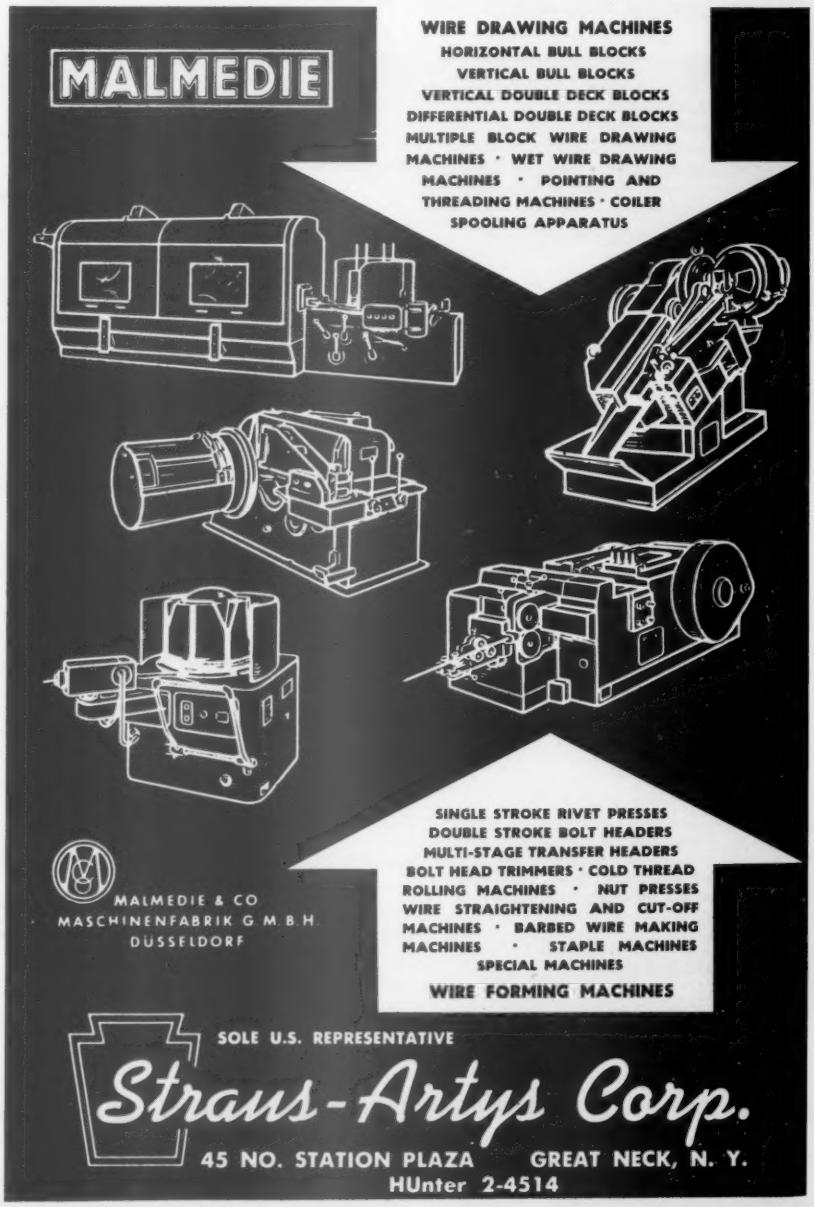
* * *

Long recognized as the most reliable materials for temperature sensing elements, the platinum metals offer high melting points, resistance to corrosion, stability in calibration and accuracy over a wide temperature range. To assist users in selecting materials best suited for their purposes, the brochure provides data on the wide range of noble metal thermoelements produced by Engelhard.

Temperature-millivolt curves, showing working ranges as well, are given for the various Engelhard thermocouple materials along with comparisons to certain non-noble combinations. The very close match of characteristics of their new Platinel with chromel-alumel thermocouples is shown graphically.

* * *

In addition to Platinel, a number of different platinum vs. platinum-rhodium, platinum-rhodium vs. platinum-rhodium, iridium vs. iridium-rhodium and other combinations are discussed. It should be


MALMEDIE
WIRE DRAWING MACHINES
HORIZONTAL BULL BLOCKS
VERTICAL BULL BLOCKS
VERTICAL DOUBLE DECK BLOCKS
DIFFERENTIAL DOUBLE DECK BLOCKS
MULTIPLE BLOCK WIRE DRAWING MACHINES · WET WIRE DRAWING MACHINES · POINTING AND THREADING MACHINES · COILER SPOOLING APPARATUS
MALMEDIE & CO
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SINGLE STROKE RIVET PRESSES
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BOLT HEAD TRIMMERS · COLD THREAD ROLLING MACHINES · NUT PRESSES
WIRE STRAIGHTENING AND CUT-OFF MACHINES · BARBED WIRE MAKING MACHINES · STAPLE MACHINES
SPECIAL MACHINES
WIRE FORMING MACHINES
SOLE U.S. REPRESENTATIVE
Straus-Artys Corp.
45 NO. STATION PLAZA GREAT NECK, N. Y.
HUnter 2-4514

noted that some of these systems enable reliable temperature measurements to as high as 2100°C.

* * *

Copies of the new brochure may be obtained from Engelhard Industries, Inc., 113 Astor Street, Newark, N. J.

New Handbook on Electric Costs In Industrial Buildings

A practical engineering guide to lower power costs, "Electrical Efficiency in Industrial Plants," has just been published by F. W. Dodge Corporation, 119 W. 40th St., New York 18, N. Y. Written by **Edwin S. Lincoln,** veteran electrical consultant and author, it is the first book to attack specifically the problems of reducing electric power and lighting costs in industrial plants and larger commercial buildings.

* * *

Down to earth in every detail, "Electrical Efficiency in Industrial Plants" tells exactly how to make surveys of load, power factor, voltage, lighting, wiring, and electric protection. All necessary instruments are discussed in detail, with emphasis on their selection, continued use, and maintenance.

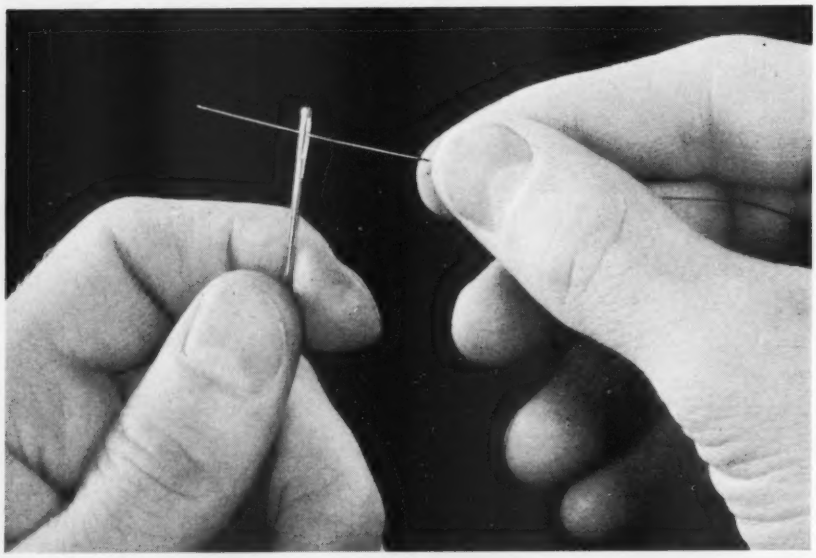
* * *

Full analysis of power costs is included, with particular attention to methods of lowering rates by minimizing peak demands. Every element in the distribution system is analyzed for its influence on efficiency, and such troublesome matters as power factor, choice of voltage, safety, inspection, and maintenance are presented directly and simply.

* * *

The book contains 235 pages of text, is 6 x 9 in size. and costs $9.50 per copy. It may be ordered from the F.W. Dodge Corporation at the address above.

ALLOY WIRE:
Tailor-made for Specific Purposes



Precision Drawn **Strand Annealed** Wire

THESE BASIC ADVANTAGES ARE BIG ONES:—

- Closer in tolerances than most commercial wires
- Make important savings in finished products possible
- Tailor-made with special characteristics to meet specific needs

Drawing specialty wire to consistent fine tolerances with specific characteristics of tensile, elasticity, hardness, grain size, etc., demands *exacting control* through all production phases. When applied to specific requirements, these "Specials" also require extensive know-how and advanced production facilities.

As a leading producer of finest quality paper mill wire cloth, woven mesh and cold drawn wire, our production team of metallurgists, engineers and technicians can help you select the right wires for any application and deliver them "on schedule."

WISCONSIN WIRE WORKS
APPLETON · WISCONSIN

New Heavy Duty Stapler

For heavy-duty service, a new self-contained, air driven Stapling Head offers unique features. Suitable for independent mounting on a base anywhere in the user's plant, the head does not require specially prepared wire stock or preformed staples. Instead, it cuts, forms and drives its own staples direct from coils of standard wire.

* * *

Driven by a pneumatic cylinder, it eliminates the need for electric motors, clutches, gear boxes and numerous precision actuating parts. Heads are fitted to produce staples from ¼" to 1" maximum width, or from ⅜" to 1½" staple leg length. Staples will penetrate materials to a total thickness of 1⅜", allowing for clinch, and are suitable for stapling woods, plastics, fibre, paperboards, etc.

* * *

Details on this PD stapler are available from **Saranac Machine Company,** Benton Harbor, Mich.

Prestressed Concrete for Bridges

County engineers across the country are finding that prestressed concrete is a natural for the replacement of outmoded bridges for new structures. Since many counties are not always able to provide adequate maintenance, bridges often have to be replaced prematurely.

An example of an attractive prestressed county bridge is the one recently completed for Franklin County, Pa., near Chambersburg. The County took alternate bids for prestressed box beams, prestressed composite I beam construction and composite steel construction. In this case the box beam design proved most economical and the total bridge was built for $10.73 per square foot. The consulting engineers said, "Both prestressed designs in addition to being initially more economical than steel had the advantages of superior appearance, longer life, and lower maintenance costs."

* * *

Harvey County, Kansas, also has completed a prestressed box beam bridge. The bridge, over Sand Creek is 255 feet long with two outside spans of 49 feet and three interior spans of 51 feet. The bridge is of composite design. Mild steel reinforcing was placed over the supports in the concrete topping to make the bridge continuous for live load. The box beams rest on Neoprene bearing pads. The piers are prestressed concrete pile bents. The completed bridge was constructed for $8.08 per sq. ft.

New Quality Control Computer

President Bryant Craig of **Diversa Electronics Corp.** has announced his company's name change and the introduction of a new model of the Q-trol quality control computer. Mr. Craig formerly was president of Texas Electronic Products Corp. which has become a subsidiary of **Diversa, Inc.**

* * *

The improved Model 60-D Q-trol quality control computer provides an electro-mechanization of the Wald theory of sequential analysis, basis of modern statistical quality control through random sampling techniques.

* * *

Demonstrating widespread application to virtually every type of manufacturing industry as well as many service enterprises interested in improving the quality of products and services, it is equally adaptable to the small shop that mass-manufactures nuts and bolts as to the major manufacturers in automotive, aircraft, and other fields. The new Model 60-D is manufactured at the Dallas plant of Diversa Electronics Corp., 5114 W. Jefferson Blvd., Dallas, Texas.

ASM Dedicates Headquarters

American Society for Metals dedicated its geodesic-domed national headquarters in Geauga County, near Cleveland, with several hundred important leaders from industry, government and scientific circles in attendance, on September 14, 1960.

* * *

Highlights of the event were dedication addresses by **Dr. Clyde Williams** and **Dr. Zay Jeffries,** and placement of a time capsule containing nearly a pound of uranium metal. **Walter Crafts,** ASM national president, presided throughout the ceremonies, and presented the building to **Allan Ray Putnam,** managing director, for "increased dissemination of technical information for constantly improving technology in metalworking."

THE NEW LOOK

IN DIAMOND DIES

Has swept the country!
It answers the need for lower production costs.

GET THE UTMOST LIFE AND SERVICE
FROM YOUR DIAMOND DRAWING DIES.

NATIONAL WIRE DIE CO., NC.

presents

THE "NATDI"

The "NATDI" is a reversible Diamond Die.

Since its introduction four years ago, "Natdi" has emerged with flying colors! Take advantage of customers' reports of:

1. TREMENDOUS INCREASE IN INITIAL SIZE PRODUCTION.
2. AMAZING ABILITY TO BE RE-CUT WITHOUT SKIPPING SIZES. THIS MEANS MORE RE-CUTS PER DIE.

Our representatives will gladly call on you at your convenience.

NATIONAL WIRE DIE CO., INC.
12 West 21 St., New York 10, N. Y.

Telephones:
WAtkins 4-6383 & 6384

Vinyl Plastisol — A Versatile Material for Insulating Wire And Encapsulating Wire Harness Constructions

(*Continued from page* 1368)

The assembly is now ready for fusion. This is accomplished by raising the temperature of the entire unit to about 350° F. The time element depends on the thickness of the cast section and the insulating properties of the mold. The heat is absorbed by the plastisol, reducing the danger of damage to the insulation on the wire. Fig. IX shows the thoroughly fused film of plastisol.

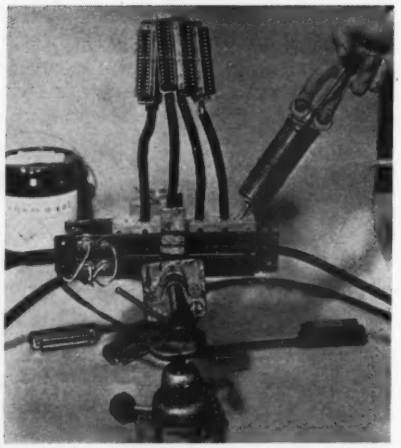


Figure VIII

Figure IX

Usually aluminum molds are used and strip heaters can be placed on each side of the mold for fusing. Other possibilities are cartridge heaters inserted into the mold and infra-red heaters. After fusing the plastisol, the molds can be cooled by immersing them in cold water or with a cold water spray. The part should be stripped from the mold while still slightly warm; at the temperature which will allow handling without discomfort. Figure X shows a completed molded harness assembly to be used on an electronic computer.

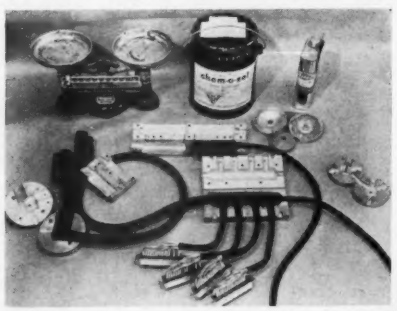


Figure X

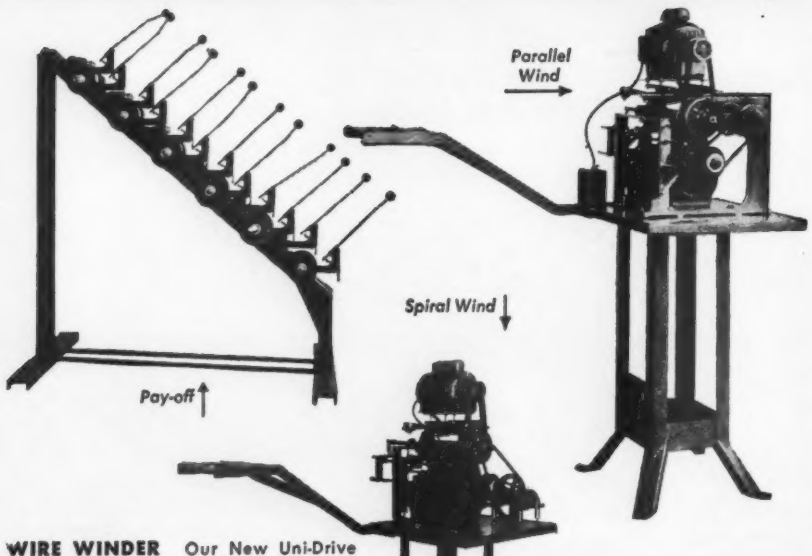
* * *

This method of encapsulating wire assemblies is used most effectively in components for computer systems, underground cables, aircraft and guided missiles, automotive and telephone equipment. There are several government specifications covering plastisols for these and similar applications; for example, MIL-P-20689, entitled Plastic, Plastisol, Molding, Extruding, Casting and Dipping Compound.

* * *

These two general examples of plastisol applications connected with wire and cable manufacture may indicate why these compounds are winning an increasingly important place in the plastics field. The future promises many signifi-

STANDARD UNI-DRIVE WIRE WINDER



WIRE WINDER Our New Uni-Drive Wire Winder is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel — no over or under-winding. Can also be furnished with a slight spiral pattern for winding exceedingly fine wire. Automatic Stop Motion controls each strand. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors.

Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAY-OFF Our Pay-off Attachment consists of a heavy fabricated frame on which Pay-off spools are mounted to cover desired number of ends to be wound. Equipped with spindles, running on self-aligning ball bearings, with size of spindles and adapters to accommodate customers' pay-off spool. Compensating Attachment to control the tension of each individual strand of wire, applying the same tension when spool is full as when empty. Can also be adapted for use with bunching machines.

STANDARD MILL SUPPLY COMPANY
31 ESTEN AVENUE PAWTUCKET, R. I., U. S. A.

cant new developments in plastisol uses over the next few years, particularly in the fast growing electronics industry.

Acknowledgments:
Photon Inc., Boston Massachusetts
Union Carbide Plastics Company

Union Carbide Plastics Opens Minneapolis Office

A new sales office in Minneapolis has been established by **Union Carbide Plastics Company** to facilitate the handling and sale of Bakelite Brand plastic molding and extrusion materials. In making the announcement of the new office, **P. W. Wood,** Regional Sales Manager, said it will be at 4010 West 65th St., Minneapolis 24, Minn. (WAlnut 7-8835), and will be supplemented by warehouse facilities at the Midway Terminal Warehouse Company, 429 North Prior Ave., St. Paul 4, Minn.

* * *

Robert K. Louis, Technical Sales Representative, will be transferred from the Milwaukee sales office to the Minneapolis office to handle sales.

Bulletin on Bonding Silicone Rubber

A four-page illustrated bulletin entitled "How to Bond Silicone Rubber" is available from the **Silicone Products Department** of the **General Electric Co.,** Waterford, N. Y.

* * *

Designated CDS-245, the publication reviews the existing bonding technology and presents some of the latest advances and new techniques which help eliminate the more difficult bonding problems. The material breaks the subject down into five practical categories of bonding problems including: (1) bonding cured silicone rubber to cured silicone rubber, (2) bonding cured silicone rubber to metal, (3) bonding cured silicone rubber to plastic, (4) bonding uncured silicone rubber to cured silicone rubber, and (5) bonding uncured silicone rubber to metal.

* * *

Fully illustrated, the publication also includes data on typical bond strengths of silicone rubber under a variety of conditions.

Autolite Acquires Leasing Firm

Robert H. Davies, president of **The Electric Autolite Company,** and **Joseph Boneparth,** president of **Equitable Leasing Corporation,** have announced that the two companies have concluded transactions under which Autolite has acquired a major interest in Equitable Leasing.

Weston Appoints Cincinnati Manager

Daystrom, Inc., Weston Instruments Div., has announced the appointment of **Harold G. Munn** as district manager of the Company's Cincinnati office at 4866 Cooper Road.

* * *

He has been associated with Weston since 1956, first as a sales engineer in the Chicago district office and for the past two years as branch manager in Knoxville, Tenn.

EQUIPMENT

Extruders
Takeup Equipment
Payoff Equipment
Spoolers
Respoolers
Measuring Machines
Capstans
Cable Strippers
Braiding Equipment
Twinners, Stranders, Cablers, Bunchers
Spark Testers
Printing Machines
Spiral Striping Machinery
Taping Equipment
Fine Wire Takeup and Respooling Equipment
Wire Drawing Machines
Specially Built Equipment
And Much More

SUPPLIES

Wire Drawing Dies
Wire Drawing Spools
All Types of Reels and Spools
Lithographed Spools
Inks for Printing Machines
Bare, Tinned and Silver Plated Copper Wire, Stainless Steel, Silver, Nickel, Bronze, Brass and Other Bare Wires
Numerous Other Items

all the wire industry in the West looks to 2 companies

First, there's Western Wire & Textile Machinery, Inc., the only company in the West that deals exclusively in used and reconditioned wire and cable-making equipment.

Secondly, there's the Paul I. Kenner Co., supplier and distributor of new wire and cable manufacturing machinery and supplies.

Nowhere else in the West will you have a better chance of finding exactly what you need - - - either new or used. Nowhere else in the West will you be able to trade in old equipment on new. Nowhere in the West will you find such a complete stock of machinery and equipment.

You'll like dealing with men who speak your business language - - - with companies backed by 20 years of highly specialized experience.

SOME EQUIPMENT ON HAND:

Takeups - Payoffs - Braiders - Asbestos Carding Lines - Taping Machines - 7 Stranders; 1 for 6 x 4 inch spools - 1 for 16 x 9 inch reels - New England Butt 24" Buncher.

2 Two companies that provide all that's needed, new and used for the West's wire industry.

WESTERN WIRE & TEXTILE MACHINERY, INC.
228 Shaw Road South San Francisco, Calif. Tel.: JUno 9-1101

PAUL I. KENNER CO.
228 Shaw Road South San Francisco, Calif. Tel.: JUno 9-1101

Properties and Processing of Ethylene Copolymers for Wire and Cable

(*Continued from page* 1325)

ASTM took a big step toward clarifying the polyethylene spectrum by dividing D1248-59T into three types based on density ranges. Type II of this specification gives a density range of 0.926 to 0.940. This range will cover most of the intermediate density copolymers which will have the most to offer in wire and cable applications. Type II is further divided into three grades based on various levels of tensile properties, brittleness, temperature, etc. The ethylene copolymers which will be suitable for wire and cable will undoubtedly meet the Grade 3, Type II specification. For those special applications requiring exceptional abrasion resistance, it may be necessary to go into the Type III classification which will allow a higher density in the copolymer.

* * *

For those who would prefer to more clearly specify the properties which they require in ethylene copolymers, we would recommend the following specification.

Recommended Polyethylene Property Specification

	Natural	Weather Resistant
1. General Classification ASTM D1248 (Latest Edition)	Type II, Grade 3 Class A	Type II, Grade 3 Class C
2. Thermal Stability 100°C., Air, On 1 X Mandrel	> 100 hours, min.	> 100 hours, min.
3. Carbon Dispersion, Western Electric 59035	———	> "C"
4. Milling Stability ASTM D1248 (Latest Edition)	Condition Per Sect. 11, e, (1)	Condition Per Sect. 11, e, (1)
5. Environmental Stress Crack Res. ASTM D1693-59T Preconditioned 7 Days at 70°C.	< 2/10, max.	< 2/10, max.

NOTE: High voltage insulation will require a special electrical life test. Reference Paper: "A Study of the Effects of Corona on Polyethylene" by McMahon, Maloney & Perkins (AIEE-58-981).

We believe that the technological advances demonstrated by this series of ethylene copolymers is indicative of what the wire and cable industry can expect in the way of tailored resins for their needs. The combination of solid state properties and processing characteristics should permit the industry to improve their current constructions and meet the demands for future requirements. Through proper specifications, we believe that resins can be tailored in this series to meet your most demanding requirements in insulation and jacketing applications.

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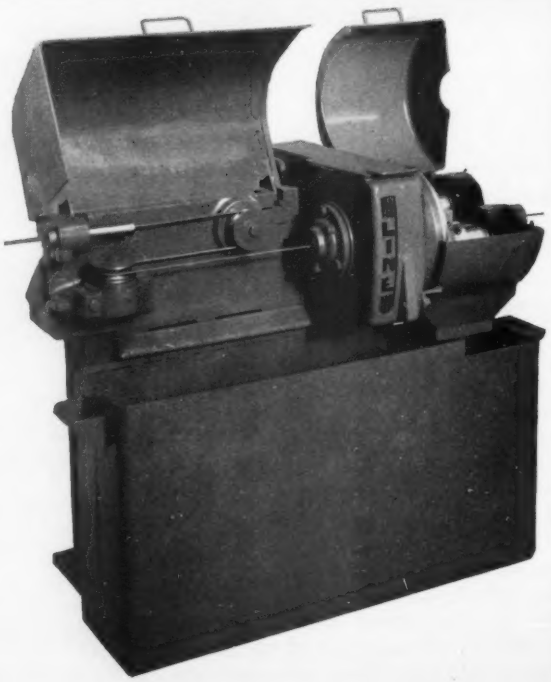

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opment of a new compact, low cost 2-high/4-high combination mill, for handling up to 6 in. wide strip at rolling speeds up to 250 ft. per min., yet occupying only 35 sq. ft. of floor space and involving a capital investment of less than $20,000.

* * *

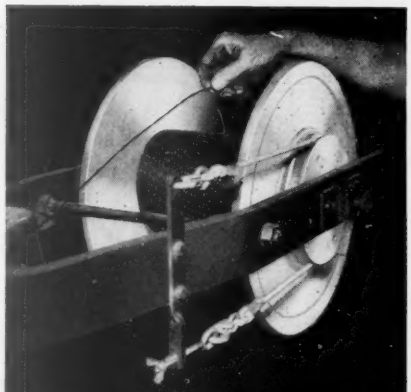
Designed and built by **Loma Machine Manufacturing Co., Inc.,** New York 16, N. Y., the new mill is furnished with two sizes of 4-high work rolls, made either of alloy tool steel or solid tungsten carbide: the 1½ in. size. is used for normal cold reduction down to 0.002 in. thickness, and the ¾ in. size allows special ultra-thin finishing to gauges of less than 0.001 in. In the 4-high set-up, the machine handles up to ⅛ in. gauge; the 2-high arrangement is used for the hot or cold breakdown of heavier materials up to 1 in. thick, but is also available for skin pass rolling of thin strip. Work roll changes can be made by one operator within 10 mins., while a complete 2-high/4-high changeover requires 30 mins.

* * *

In recent tests the mill successfully reduced such tough metals as stainless steel, nickel, zirconium, platinum and beryllium copper, as well as such clad materials as rolled gold plate, thermostatic bimetal, indium-aluminum and silver-antimony. The resulting strip, even in ultra-thin gauges, showed excellent flatness, perfect surface finish and closest thickness tolerances.

U.S.I. Doubles Polyethylene Capacity at Houston

A new section of U.S.I.'s polyethylene production plant at Houston, Texas, has just gone on-stream. This doubles the capacity of the plant, and establishes U.S.I. as the second-largest producer of polyethylene in the world, according to **Dr. R. E. Hulse,** Executive Vice President of National Distillers and Chemical Corporation, and General Manager of the **U. S. Industrial Chemicals Company Division.** This latest expansion brings U.S.I.'s total production capacity of Petrothene low and medium density polyethylene resins to 300 million pounds per year.



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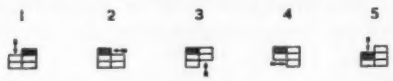
The Application of Enamel Coverings to Rectangular Copper Sections and Their Specialised Application in the Manufacture Of Continuously Transposed Conductors

(*Continued from page* 1350)

two stacks, side by side, one stack

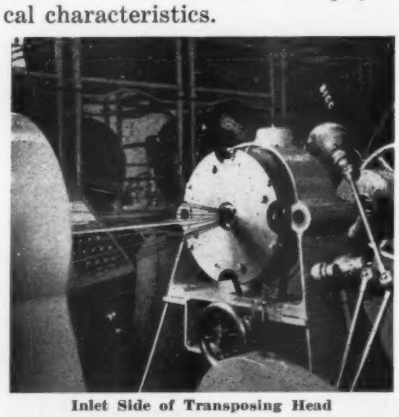


5 STRIP TRANSPOSING CYCLE.

having one strip more than the other. In operation the head moves this extra strip laterally to the top of the other stack. The next finger action is to lift the depleted stack. This is followed by a further lateral movement in the opposite direction and on the underside of the stack. The cycle is completed by a fourth movement in which the depleted stack is depressed. The cycle of four movements is constantly repeated and results in the continuous transposition of the conductors. The completed stack, on leaving the transposing head must be rigid and this is brought about by careful control of the lay during transposition.

* * *

In order to establish contact-free characteristics between any pair of strips and throughout the length of the transposed conductors, close attention to detail was necessary at the strip enamelling stage. The choice of enamel was also of importance, an enamel based on polyvinyl acetal was selected in view of its robust physical characteristics.



Inlet Side of Transposing Head

Care during the transposing operation had to be exercised to avoid abrading the enamel and it was quickly ascertained that the length of lay in the transposition is of importance. Too short a lay created a scissoring effect between the strips which in turn promoted faults, while too long a lay led to a loose stack liable to collapse during the winding operation. Best results were found with lays between 3″ and 4″. As a further precaution against damage, an interleaving paper was inserted between the two stacks during the transposing operation.

* * *

The remainder of the plant followed a pattern familiar to those experienced in the cable industry.

* * *

A carriage was designed in which the 27 individual spools revolve in a planetary motion. The strips must not twist during the revolution of the carriage. Prior to leaving the carriage the individual strips pass through a specially designed and patented planetary head sited in the nose of the carriage. (4) This is to ensure that all the strips are in the same plane prior to reaching the point of transposition. A system of rollers and a die situated within the previously described transposing head ensure that no movement to the stack occurs during transposition.

* * *

In order to apply the required papers after transposition, a multi-head paper lapping unit was installed operating in tandem with the transposing head. Detailed consideration had to be given to tension control when applying the papers since paper applied loosely or too tightly would prove detrimental during subsequent winding of the transposed conductors.

* * *

Finally the paper lapped continuously transposed conductor passes over a capstan prior to being wound onto the despatch drum. It is important at this stage to maintain a constant tension, since any variation in tension during the process would cause serious imperfections to arise at the point of transposition.

* * *

The plant is capable of transposing from 5 to 27 conductors in widths of 0.12″ to 0.30″ and in thicknesses ranging from 0.45″ to

0.90". The single length which may be continuously transposed varies according to the section of individual conductors required. For example, a 27 strip transposition incorporating rectangular conductors 0.240" x 0.075" can be produced in a continuous length of 1200 yards, the total weight of such a transposition being 3 long tons.

* * *

An essential feature of the process is the continuous testing for contacts between strips during manufacture and it is the aim at all times to manufacture the entire length of continuously transposed conductors contact-free between any pair of strips.

* * *

With two years successful operation behind us there has been a steady and continuous build-up of load which has justified the policy of selling the transposed strip at a very modest increase in price over the prices of the single enamelled strips.

* * *

To conclude, the introduction of continuously transposed conductors for sale on the open market is rewarding from the winding wire manufacturers point of view since it has opened a market for long length production of enamelled rectangular sections. The transformer manufacturers have also benefited since a new product and technique is now available to them which provides opportunity to exercise further economies in both labour and materials.

References

(1 & 2) General Electric Co., New York, U. S. patents Nos. 2234996 and 2249509.

(3) U. K. patent application No. 27205/58 and corresponding patents and applications in Belgium, Canada, France, West Germany, Switzerland, and U. S. A.

(4) U. K. patent application No. 25057/58 and corresponding patents and applications in Belgium, France, West Germany, Switzerland, India, and Canada.

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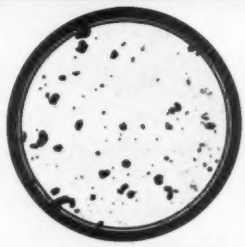
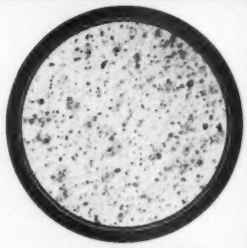


BEMOL PURE MOLY POWDER ADDED TO A DRAWING OIL



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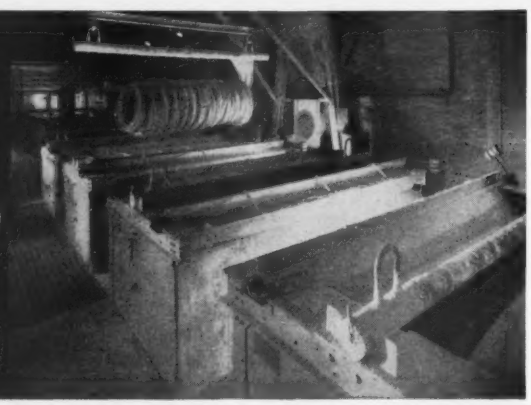

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What is Meant by "Straight Wire"

(*Continued from page* 1340)

are necessary to straighten small wire than large wire in a given length. One stress pattern is developed for each revolution of the Straightener Arbor, and to produce closer stress patterns in small wire it is necesary to pull less wire through the arbor per revolution.

* * *

The heart of the Straightening Arbor is the Straightening Die. The Die contacts the wire with a contour that must hold the wire in the desired bent condition as the wire feeds through, while at the same time the die is rotating around the wire. The device is mechanically similar to a journal bearing where pressure and friction play the important parts. A Straightener Die that presents a contour with a long, large bearing area will spread the straightening stress pattern over a long length and allow higher straightening speeds without waviness.

* * *

Surface marking from the dies is the result of the rubbing action under pressure. The die contour, die material and lubrication must be considered when trying to eliminate die marking. Materials for dies range from carbides for long wear, to bronze, babbitt or plastic for least surface working.

* * *

Some wires tend to harden and others soften when straightened in the arbor. Being a device where cold working and heat from friction are present it is natural to expect a work hardening and annealing effect on the wire. Which effect takes precedence depends on the wire's susceptibility to change and how much it is being worked. Hard wire tends to get fairly warm during straightening, and the flexing along with the heat will reduce the tensile of some wires. Soft wire develops less heat and might cold work somewhat.

* * *

Straightened wire often has an increase or decrease in diameter either throughout its length or in one spot. The wire will tend to increase in diameter if the wire is

in compression while being straightened. The wire will tend to decrease in diameter if in tension. The straightening or bending action has the wire partially in the yielding state and if at the same time it is pushed or pulled through the arbor, the natural tendency is to increase or decrease. Should the wire move continuously through the arbor, the increase or decrease would be uniform throughout the length. The localized or spot increase or decrease is the result of the wire stopping or being slowed down momentarily. The wire being under the straightening action longer in one area, changes size more in this spot than in the rest of the wire. The uniform change can be corrected by sizing the wire when drawn to compensate for change during straightening. The spot deformation is more difficult to correct. Stationary Shear type cut-offs stop the wire and are very susceptible to spot deformation. A Flying Shear type cut-off (such as our Travel-Cut), along with a moving gauge mechanism minimizes the spot deformation where accurate lengths are required. The Flying Shear without a gauging mechanism will allow a continuous movement of wire, hence there is no spot deformation but some variation in length will occur. Lubrication of the wire, with low forces pushing or pulling the wire will minimize the size change.

* * *

The torque imparted to the wire by the friction and rotation tends to put a permanent twist in the wire, sometimes causing trouble in forming or heat treating. The twist will occur when there is an end free to turn as is common with a rotary type straightening and cutting machine. The one end is locked in the coil but the other end runs straight out and can rotate due to the friction of the straightening action and form a permanent twist. Any method of reducing the friction or preventing the wire rotation will reduce the twisting. Lubrication of the wire, stopping the rotation with feed rolls, counter rotating arbors, recoiling or just having the wire

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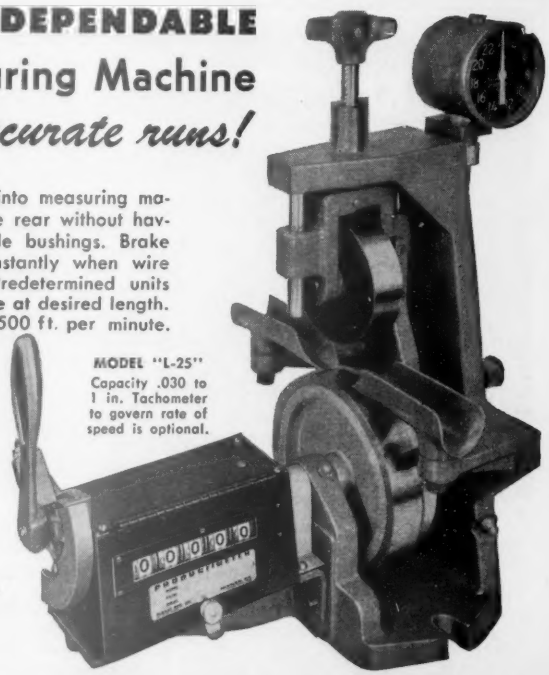

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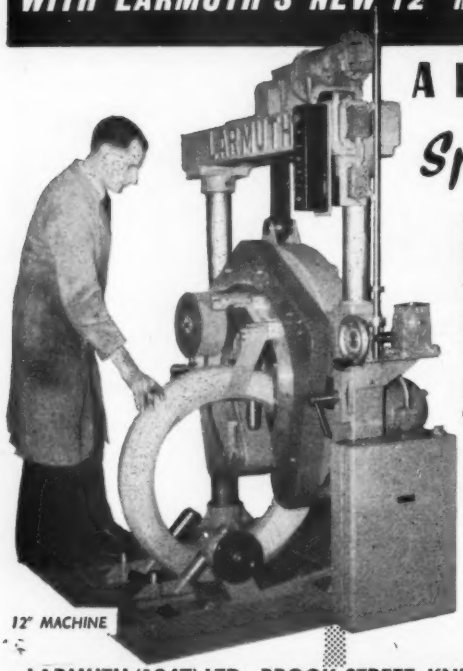

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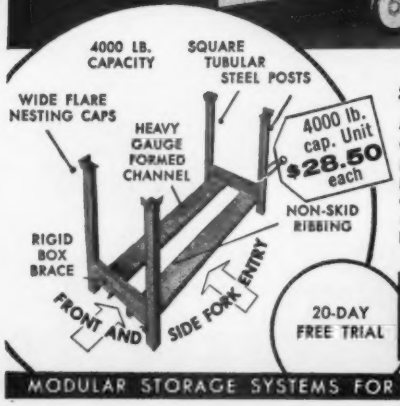

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* * *

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* * *

This presentation of the mechanics of straightening to the people concerned with the production of straight wire should help both the producers of the wire and machinery manufacturers. We have found that straight wire to one user is not straight wire to another. The degree of straightness required for different jobs varies and the industry apparently uses no set standard. One use might be core wire where anything goes, and another, precisely straightened wire to run through an automated process.

* * *

As the degree of straightness, rate of production and cost of machinery are all related, it is worth while considering what is meant by "straight wire."

Riverside-Alloy Re-Issues Phosphor Bronze Handbook

An 18-page technical handbook on phosphor bronze has been reissued by **Riverside-Alloy Metal Division,** H. K. Porter Company, Inc. It was up-dated and reprinted from the original catalog published in 1959.

* * *

In addition to a detailed explanation of continuous casting, the handbook includes information on phosphor bronze wire, bars, rods, strip, sheets, circles and special shapes. Flexograin, a special fine-grain phosphor bronze, is also discussed in detail. Complete specifications on six of the phosphor bronze alloys are also given in an easy-to-read format.

* * *

Copies of the handbook are available upon request by writing: Publications Section, Riverside-Alloy Metal Division, H. K. Porter Company, Inc., Riverside, N. J.

A New Design for Manufacturing Welded Wire Fabrics

(*Continued from page* 1338)

drive for the welder. This motor drives every phase of the operation except the cam drive for the electrode bumper. Following the motor is a coupling, a change gear unit, and the reducer for the tractor drive unit.

* * *

Figure No. 10 — This is a continuation of the drive showing the change gear drive and the reducer for the cross wire feed conveyor and magazine drives. In the change box is the mechanism to adjust the speed of the machine when changing wire spacings. Here can also be seen the drive motor for the bumper drive.

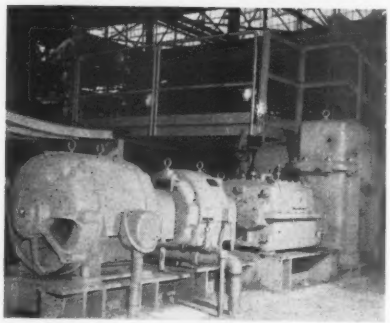

Figure 10

* * *

Figure No. 11 — This is an overall view of the operation taken from the coilers. Mats were being cut at this time. Since the machine is a continuous operation type provision had to be made to absorb the mesh while the shear is performing its operation. This is done by the humping table.

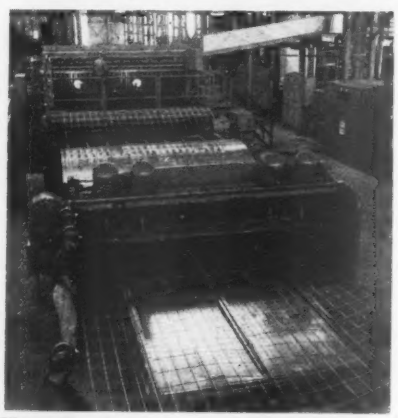

Figure 11

* * *

In the background can be seen

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the cross wire storage and the transverse wire storage and feed area.

* * *

Because of the operating speed, two coilers are provided at the finishing end. The coilers have 10" dia. bi-part-ing mandrels. No. 1 coiler has an underpass to allow the mesh to pass under to the No. 2 coiler. The coilers are driven through an electric clutch similar to the one on the main drive except for horsepower. The mandrels and elevators on the coilers are operated by a hydraulic system.

Airport Concrete Pavement Handbook

The welded wire fabric industry, and its trade association, **Wire Reinforcement Institute,** announce publication of the new WRI Airport Concrete Pavement Handbook. The 96 page, illustrated book, offers designers of airports, descriptive information, data, tables, and design criteria for design of reinforced Portland Cement concrete pavement for airports handling all types of planes.

* * *

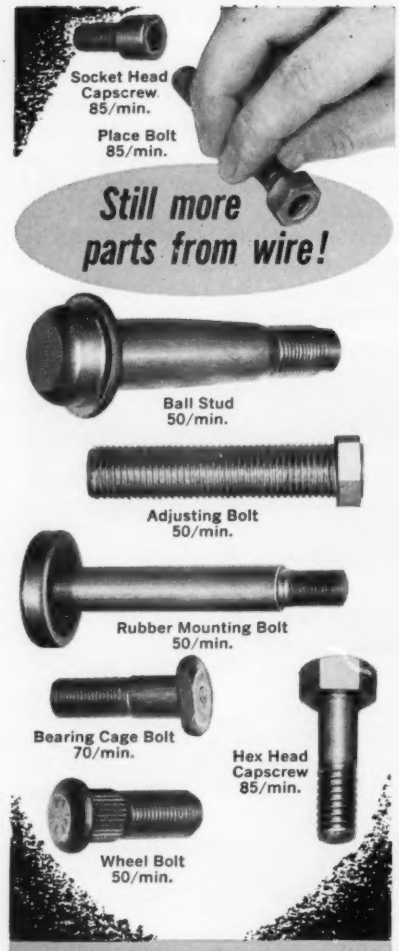
The handbook covers these major topics — basic factors in design; concrete pavement design fundamentals; subgrade, subbase and drainage; pavement thickness; reinforcement design; construction practices; concrete overlays; advantages of reinforcement; and welded wire fabric data.

* * *

Also included is a table of aircraft loadings and landing gear details and specifications for wire fabric and the cold-drawn wire from which it is made. Sketches show typical layouts of runways, intersections, reinforcement and joint details.

* * *

The book will be sent without charge to interested persons who request it on their organization's letterhead. Address requests to Wire Reinforcement Institute, Dept. AP-11, 1049 National Press Building, Washington 4, D. C.



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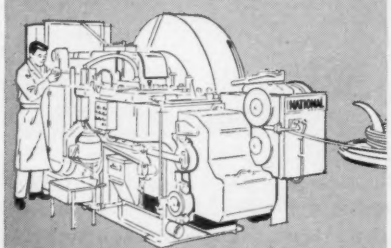

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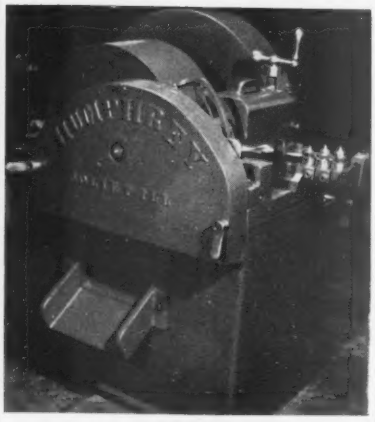

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Some Factors Influencing the Performance of Non-Ferrous Wire Drawing Lubricants

(*Continued from page* 1335)

moving the moisture laden air and expelling it to the outside. Temperature much over 140° F. may result in wire going onto the reel so hot that it discolors due to oxidation.

Excessive Foaming

Some wire drawing machines and systems are more prone to foam than others. Excessive foaming is more likely to occur with a freshly made up solution. Antifoam additives rarely give consistent results and are likely to be only temporary in their effect. Foaming in the machines themselves may be controlled successfully by removing obstructions in the return line thereby decreasing the volume in the bottom of the machine housing which is being churned by the capstans. The return lines should have ample capacity to permit the maximum volume flow from all machines taking into consideration possible build up of sludge in the lines.

* * *

Foaming in the main tank can normally be controlled by spraying the foamy surface of the solution with the circulating solution itself. This spray system can be rigged without much expense by tapping the delivery side of the line serving the machines. A one inch line can be run to a header with spray nozzles directed to the foamy surface. Excessive foaming can be beaten down by this device in nearly every case.

* * *

For drawing intermediate ranges of wire, the problems are much the same as for rod machines.

Fine Wire Drawing

For drawing the fine sizes of wire including the ultrafine or superfine wire the problems differ to a great extent. As far as compound is concerned, the liquid types, requiring no boil up procedures are gaining in use. The prescribed amount is

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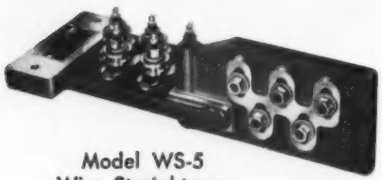

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for straightening wire with round, flat or irregular cross sections. Two sets of grooved rolls set at right angles remove all material curvature in both planes. Five Standard models will handle wire sizes up to .1875 while the two Heavy Duty Models handle wire sizes from 1/16" to 3/8"

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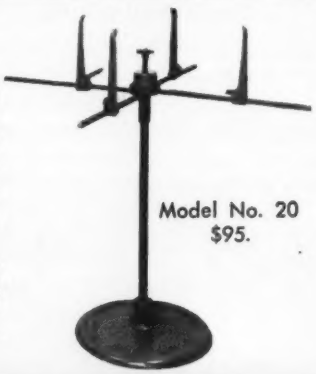
The inexpensive wire reel, illustrated, is designed as a horizontal support for coils of brass and steel wires, weighing up to 250 lbs. An adjustable drag helps regulate the proper wire tension to eliminate overtravel and tangling. The vertical shaft is central on the heavy base to make floor fastening unnecessary.



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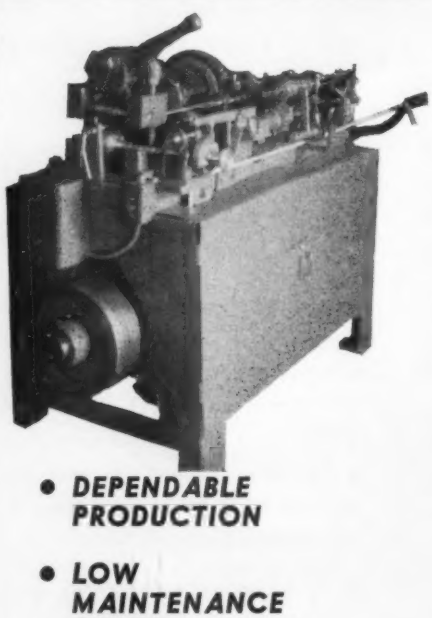

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simply poured into the tank with gentle agitation and it is ready to draw. The tendency for the wire to wrap up on the capstans or rolls is great if the solution has gumming characteristics. Owing to the low breaking strength of the very fine sizes it becomes increasingly important to avoid sticking of the wire to the rolls. The use of chelating agents to minimize copper soap formation and to soften the water aids in reducing gumming. Copper soap and precipitated hard water soaps are rather sticky. Since gumming increases with use, a point is reached where it is poor economy to use a solution longer trying to get a few more pounds of high priced wire out of a spent low priced solution. Some operators, drawing the truly fine sizes of wire, fail to realize the delicate situation involved. Such a drawing operation is like the operation of a watch and slight stickiness is a real problem.

* * *

At times a well used solution may be redepositing "crud." Increasing the strength to increase the detergency will prolong the life of the solution somewhat.

* * *

Care should be taken to avoid splashing or the issuance of spray onto the wire after passing through the final die. Any solution splashed onto the wire can result in spotty wire on annealing and subsequent poor enameling.

* * *

There is always a very thin residual lubricant film on drawn wire. Wire to be annealed or enameled should be processed within a reasonable time (a day or two instead of weeks). Lengthy storage may cause discoloration of the wire due to reaction of the residual film with the thin oxide film always present on copper. The deposition of atmospheric dust and the exposure to fumes is also detrimental. Annealing and enameling troubles can be minimized by prompt handling.

* * *

When annealing continuously, the water quench should be renewed either continuously or fre-

quently to avoid the accumulation of residual film decomposition products which may redeposit on the wire and cause enameling difficulties.

* * *

Wetting agents are useful in the water quench (as long as they are not detrimental in themselves) to provide uniform wetting. Water spots are avoided when the wetting agent prevents the gathering of water into droplets.

* * *

In a wire mill there can be many sources of trouble. It is hoped that the above factors may be helpful in eliminating some of the lubricant difficulties.

References

(1) **The Behavior & Control of Wet Wire Drawing Lubricants for Copper by R. C. Williams Wire & Wire Products, Vol. 19, P. 771, 1944**

(2) **The Control of Wire Drawing Solutions for Copper by R. C. Williams Wire & Wire Products, Vol. 27, P. 1032, 1952.**

New Small Part Header

An improved open die precision cold heading machine for making long, thin parts such as lead wires, pins, or rivets has just been announced by **REM Sales, Inc.**, a subsidiary of the **Robert E. Morris Company.**

* * *

A full 50% heavier than the previous model, the new machine comes equipped with motor and Vee belt drive which makes possible production rates of 60, 90, or 110 pieces per minute on parts up to 2⅜″ in length with a nominal wire capacity of .020″ to .090″ diameter.

* * *

The machine is furnished with two sets of straightening rolls, a 9 roll straightener for fine wire up to .036″ and an auxiliary 5 roll straightener for wire sizes of .036″ to .090″. One-shot lubrication system and a set of prototype tools are part of the standard equipment.

* * *

For further details write to REM Sales, Inc., Box 41, West Hartford, Conn.

DOUBLE TWIST QUADDING MACHINE

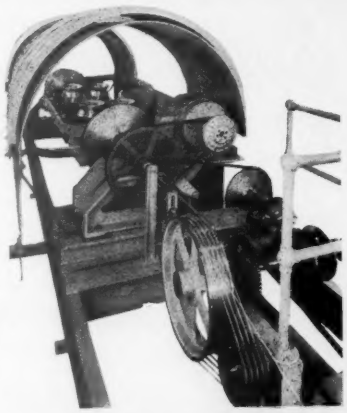
The photo shows our High Speed Light Duty Double Twist Quadding Machine viewed from the out put end.

In this construction all four reels are placed in the cradle. Each reel is mounted on an independent mandrel, rotating freely on anti-friction bearings and fitted with our patented Constant Tension and Over-Run Prevention Device.

Reel sizes vary up to 24 inches in diameter and 12 inches over all width.

Production from 1000 to 1400 twists per minute, depending upon reel size.

In size this machine is slightly wider and larger than our Standard Two Wire 30″ Frame Twister.



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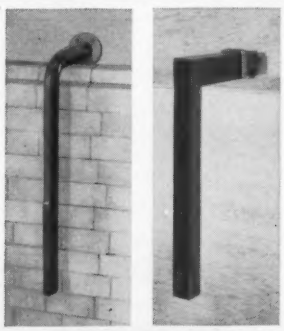

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The Manufacture of Telephone Cords

(*Continued from page* 1330)

vent cutting of the conductor when the shank of the tip is formed around the conductor. Although the tips and bands used on cords have become smaller and smaller through the years to match the miniaturization of cords, the quality of these piece parts has improved primarily due to improved tool design and construction.

* * *

The cords from the bench-work area and the tips and bands from the piece part manufacturing area are brought together in the cord finishing area for assembly. The terminal tips and anchoring bands are attached to the cord ends in semi-automatic machines specifically designed for this work by our own engineers. This work was formerly performed with commercial punch presses, but the special machines attach hardware to 518 cord ends per hour as compared to 112 on punch presses. These special machines automatically position the cord tip as it is fed to the machine from the strip made in the piece part area. The movement of the tool slide to and from the loading position, the disposal of the scrap conductor ends cut off at the tipping position and the removal of the completed cord end from the machine are all automatic. The only manual work required at these machines is placing the band in the tool nest and placing the cord end on the tool slide. Figure 4 is a picture of one of these machines with the guard open and a new cord loaded ready for tipping and banding.

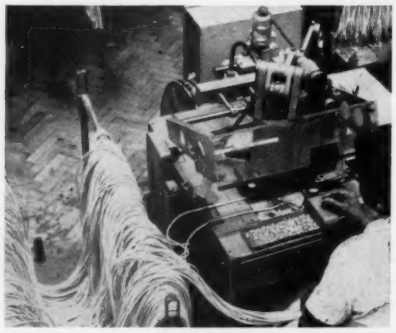


Figure 4 * * * * * * * * * *

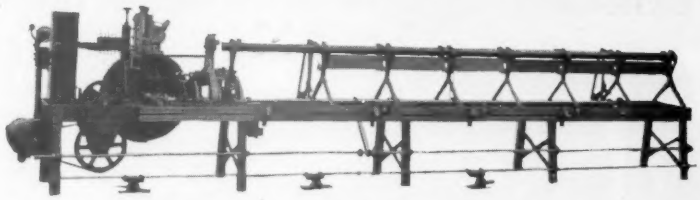
After the two ends of the cords have been equipped with the tips

and bands, the cords are transported on the dollies to another specially designed machine. This next machine coils the cords onto steel mandrels preparatory to the heat treating necessary to set the cord in its final shape. The spring cord coiling machine resembles a small bench type lathe. This machine winds the cords and evenly distributes the convolutions automatically. The machine also stops automatically when the last part of the cord is wound on the mandrel. Fig. 5 shows a cord coiling machine.

Figure 5

The cords on the mandrels are placed on an endless conveyor and carried through an oven where they are treated for 10 minutes at 265°F to give the cords a "set" or "memory" in the basic spring shape. As the cords leave the heat treating oven, the conveyor carries them to a position for unloading where the cords are removed from the mandrels and placed in a machine which reverses the direction of the helix of the cord. The reversal of the helix is accomplished by rotating both ends of the cord in opposite directions as the cord is carried by an endless conveyor through the machine. This machine can be adjusted to obtain independent variations in the amount of stretch and overtwist, and to remove the overtwist automatically. The overtwisting step serves the vital function of temporarily deforming the cord in

DOWNEY Single Loop Bale Tie Machine



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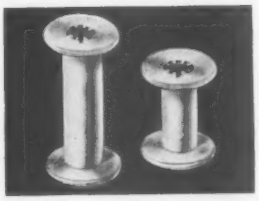

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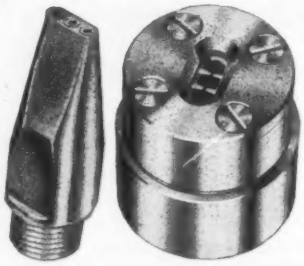

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such a manner as to more uniformly distribute strains induced in various components of the spring cords during the formation and reversal thereof. The convolutions remaining in the cord after the overtwist has been removed are of substantially uniform diameter, pitch and spacing. These machines also automatically wash, rinse and dry each cord in order to clean the surface of the cords. This is necessary because of the light colored, pastel shades now used. The washing feature cleans both the inside and outside of the convolutions. Each machine will reverse and wash approximately 1100 cords per hour. Fig. 6 shows the loading end of the cord washing and reversing machine.

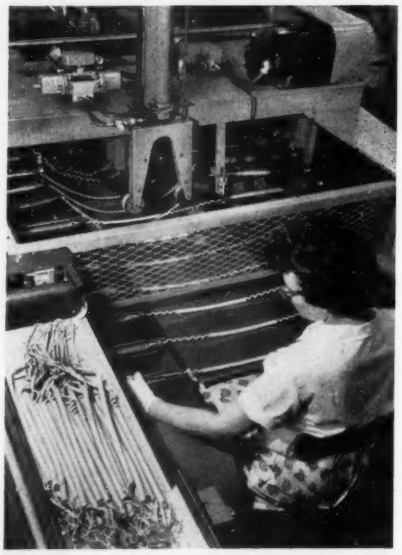

Figure 6

* * *

All telephone cords are tested to guarantee rigid electrical requirements. In addition, the spring cords are checked on a sampling basis to insure that the convolutions of the helices are relatively uniform in each cord and that the cords have the desired spring characteristics. The checks for spring characteristics are very simple and consist of suspending a specified weight on the end of the cord for a definite period of time and checking the amount of untwist in the

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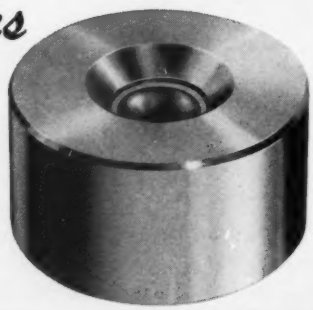

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cord while the weight is suspended and then checking the retracted length of the cord after the weight is removed. This check is made while the helices of the cord are in the reverse direction and also in the direction they had when heat treated on the mandrels. In both cases the values of untwist and recovered length must be approximately the same to produce a cord that will give the customer satisfactory service.

* * *

In closing we would like to describe a substantial material savings we have just completed which involved tinsel cords. The core and knitted barrier of the tinsel conductor were changed from cotton to nylon yarns. Since nylon has a higher strength than cotton it was possible to use smaller yarns and still retain the same breaking strength. In the case of the core yarn the size decreased from .028″ to .017″ dia. This smaller diameter requires less of the .001″ x .017″ wide tinsel ribbon per turn and when applied to our total sales of 25,000,000 spring and straight tinsel cords has resulted in a saving of approximately 50 tons of bronze per year. The insulation and jacket diameters were reduced in proportion with a resulting saving of 600 tons of PVC per year. In addition **Bell Telephone Laboratories'** tests indicate these cords will have a longer service life than the cotton core cords.

Wire Kinks

(*Continued from page* 1395)

is graphite and generally the initial coating is sufficient to allow the wire to be drawn through the die. The material is usually annealed between passes and the whole process is repeated for each pass.

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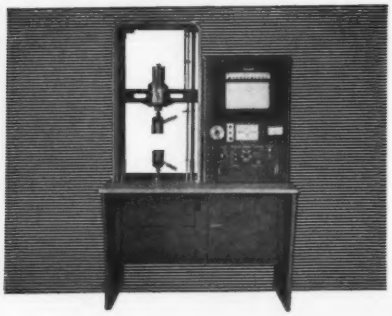

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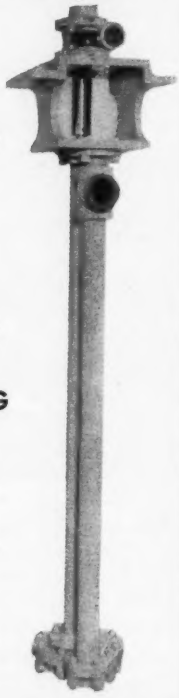

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* * *

A feature is the extra-heavy wall of REA approved PVC compound extruded over each pair of No. 19 or No. 22 AWG annealed copper conductors. The conductors are insulated with high-density polyethylene.

* * *

Each jacketed pair is color coded by an overall color and a stripe that is an integral part of the jacket. The overall color corresponds to the "ring" color, while the stripe corresponds to the "tip" color of REA Specification PE-15.

* * *

In assembling, the jacketed pairs are twisted around a polyethylene-covered extra high strength .109" or .134" galvanized steel messenger wire.

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Cables of 6 pairs or less are twisted directly around the mes-

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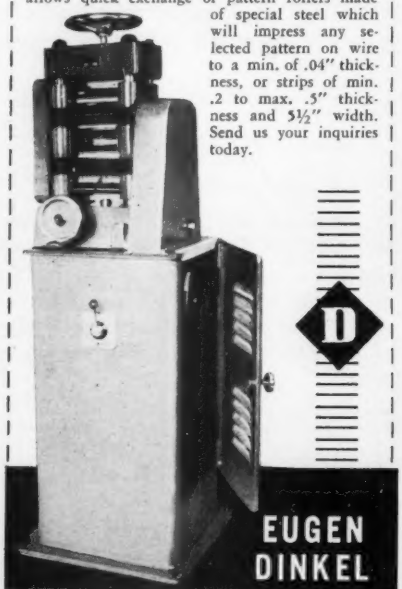

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senger. Cables with more than 6 pairs are twisted together in groups.

* * *

For further information, write **Robert H. Beisswenger,** Vice President, Whitney Blake Co., New 14, Conn.

Triangle Starts Production of Fiber Conduit

Production of their new Bituminous Fiber Pipe and Conduit began in September, it has been announced by **Triangle Conduit & Cable Co., Inc.** This development is said to place Triangle in the position of offering the most complete and diverse line of metallic and non-metallic pipe and tubing in the United States. The company now is a leading manufacturer of copper tube, plastic pipe and conduit and steel conduit as well as wire and cable, brass and copper rod wire and bar and marking inks.

* * *

Fiber Pipe and Conduit production will take place at the company's 210,000 square feet plant at Landisville, N. J., which is the most modern and fully automated Fiber Pipe Plant in the world. Tremendous production capacity and highly controlled quality will result, Triangle officials state.

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Gold 99.99+% pure alloyed with antimony, silicon, germanium, gallium or tin and fabricated into spheres, foil, washers, discs, rectangles and squares for semiconductor devices is now available from **Alpha Metals, Inc.**

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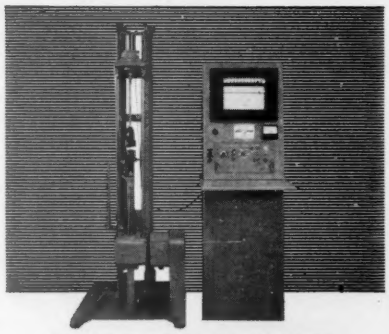
For technical data sheets on Alpha gold alloys and other Alpha semiconductor device alloys, write to Alpha Metals, Inc., 56 Water St., Jersey City 4, N. J.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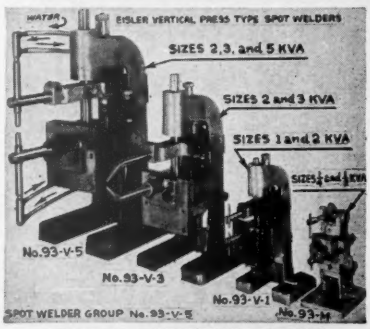

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Carbon Block Brazing of Stranded and Solid Copper Wire

(*Continued from page* 1321)

strained from turning but is free to slide horizontally. A weight over a pulley is attached to the jaw shaft and keeps the wire taut. A counter is used to record the number of turns before failure. The right hand jaw is rotated by a hand crank as shown. Electric brazes show up surprisingly well in this test.

* * *

A third possibility in braze testing is fatigue testing. Fig. 18

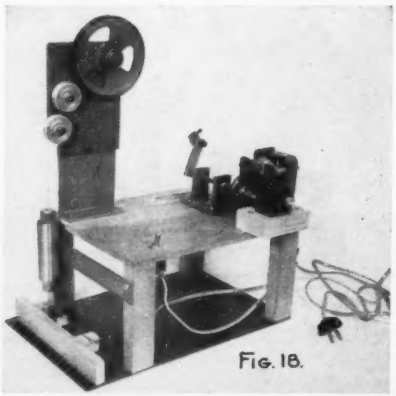


Fig. 18.

shows a fatigue testing device designed by the writer which appears to have interesting possibilities in determining the resistance of brazed points to fatigue. As will be seen from the illustration, a small motor operates a crank, to which one end of the wire is attached. The wire then passes over two ball-bearing pulleys in such a manner that, with each stroke of the crank, the wire and the brazed joint pass through two 90 degree turns with a reversal in the direction of bending. The wire is fastened to a suitable weight which falls when the wire breaks, stopping the motor. A counter records the number of cycles before failure.

* * *

A fourth possible test would be that of impact to determine the toughness of the brazed joint. This could be accomplished by applying a sudden tensile loading to the brazed wire.

* * *

Control of braze quality in production may be easily obtained by establishing specifications for the

qualification of the brazer operators. Initial qualification is usually based on an operator making a specified number of test brazes which have a tensile efficiency that is equal to or greater than a specified figure. Figures of 88% for solid wire and 85% for stranded wire have been used with good results. The operators are usually required to re-qualify each week by submitting a prescribed number of test brazes for tensile examination. Fig. 19 shows a typical

Subject .019 Braze Samples

The following are test results showing the ratio between braze and copper breaks of the subject material. The samples were submitted for the week commencing May 9, 1960.

	# 7652 Smith	# 6984 Doe	# 5632 Roe	# 5483 Jones	# 3299 Gray	# 4537 Brown
	96.2%	100.0%	99.1%	96.3%	99.1%	96.2%
	99.1	99.1	99.1	99.1	96.2	98.1
	96.2	99.1	99.1	98.1	98.1	98.1
	96.2	99.1	99.1	98.1	98.1	94.3
	92.5	99.1	99.1	99.1	99.1	99.0
AV.	96.0	99.3	99.1	98.1	98.1	97.1

These operators are hereby qualified to make brazes for the week commencing May 9, 1960.

Signed _____
Brazing Supervisor

FIG. 19

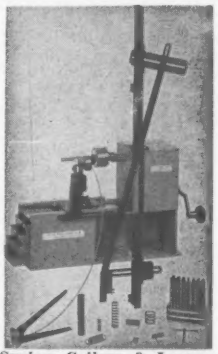
re-qualification report for six operators working on solid wire. It will be noted that the lowest average for five brazes made by an operator is 96.0% and that the lowest figure for a single braze is 92.5%.

* * *

Standard quality control techniques have been employed very effectively in controlling the quality of brazed joints in wire especially in conjunction with an operator qualification procedure such as that just described.

* * *

Substantial research and development work is going on at the present time which holds out considerable promise for the future of this method of wire joining. New types of brazer units for larger sizes of both solid and stranded wire are currently being developed with significant improvements in the precision handling and positioning of the wire ends and in the quality of the brazed joints themselves. One example of brazed joints made with recently developed equipment is shown in Fig. 20. The joint shown was made in a bunch strand conductor consisting of 175 strands of No. 34 (.0063 diameter). The stiffened and annealed section is sharply re-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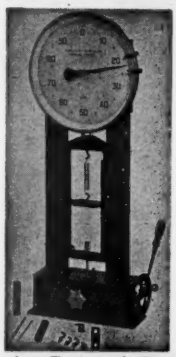
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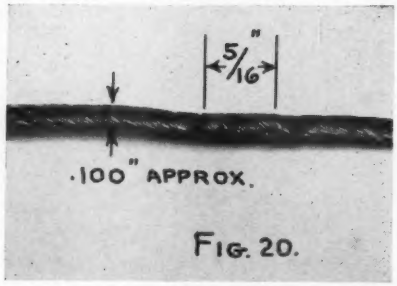

FIG. 20.

stricted to a length of only 5/16" and there are no strands that are loose or detached. It would be virtually impossible to make such a joint by the use of a gas flame with flux or by other forms of brazing available today.

* * *

It is felt that carbon block brazing is relatively in its infancy and that, as time goes on, its acceptance and use by the wire industry will grow substantially.

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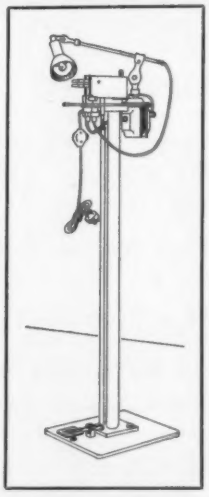

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1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Richard E. Brown, 453 Main Street, Stamford, Conn.; Editor, Edmund D. Sickles, 453 Main Street Stamford, Conn.; managing editor, none; business manager, Ruth S. Spengel, 453 Main Street, Stamford, Conn.

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An Economic Analysis of Acid Pickling vs Multiple Strand Blast Cleaning of Wire Rod

(*Continued from page* 1315)

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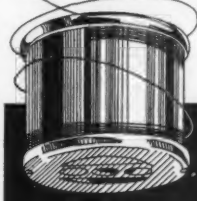
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Boulin, Victor J. Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Ft. Wayne Wire Die Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES DIAMOND—Reversible
Alabama Wire Die Co., Fayette, Ala.
Indiana Wire Die Co., Fort Wayne, Ind.
National Wire Die Co., Inc., New York, N. Y.

DIES—Extrusion
Central Tool and Machine Co., Bridgeport, Conn.
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rivom, Dijon, France.
Rusch Wire Die Corp., Croton-on-Hudson, N.Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool & Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Alabama Wire Die Co., Fayette, Ala.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Roll Threading
Rivom, Dijon, France

DIES—Special Shapes, Etc.
Alabama Wire Die Co., Fayette, Ala.
Eastern Carbide Corp., New Rochelle, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Rivom, Dijon, France

DIES—Swaging
Sjogren Tool & Mach. Co., Inc., Auburn, Mass.

DIES—Tinning
Roux Wire Die Works, Inc., Oriskany, N. Y.

DIES—Tube Drawing
Alabama Wire Die Co., Fayette, Ala.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rivom, Dijon, France
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRIVES—Variable Speed
Allis Co., Louis, Milwaukee, Wisc.

DRUMS—Wire Packaging
Hubbard Spool Company, Div., Van Norman Industries, Inc., Garrett, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Company, Div., Van Norman Industries, Inc., Garrett, Ind.
Republic Steel Corp., Berger Div., Canton, Ohio

DRYING EQUIPMENT—
Carl Mayer Corp., The, Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

DUST COLLECTORS—Wet or Dry
Pangborn Corporation, Hagerstown, Md.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FOAM PRODUCING COMPOUNDS—
Amchem Products, Inc., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Ajax Electric Company, Philadelphia, Pa.

FURNACES—Galvanizing Equipment
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Company, Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)
Wilson Lee Engr. Co., Cleveland, Ohio

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Company, Philadelphia, Pa.
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)

FURNACES—Salt Bath
Ajax Electric Company, Philadelphia, Pa.

FURNACES—Strand Annealing
Ajax Electric Company, Philadelphia, Pa.
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)

GALVANIZING EQUIPMENT—(See MACHINERY—Galvanizing Wire)

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool & Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INKS—Printing, for Insulated Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.

INSULATING MATERIALS—
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Dow Corning Corporation, Midland, Mich.
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Plymouth Cordage Company, Plymkraft Division, Plymouth, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, Naugatuck, Conn.

LACQUERNG SYSTEMS—See MACH.—Lacquering Electric Wire

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINE CONTROLS—Electronic
Allis Co., Louis, Milwaukee, Wisc.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Behr Machinery & Equipment Co., Rockford, Ill.
Glader Wm., Machine Works, Chicago, Ill.

MACHINERY—Blast Cleaning
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.

MACHINERY—Bobbin Winders
Associated American Winding Machinery, Inc., New York, N. Y.
Hanson & Edwards, Ltd., Warrington, England
Larmuth and Bulmer, Limited, Manchester, England

MACHINERY—Bolt, Rivet, Screw, etc.
Boltmaster Co., The, Cleveland, Ohio
National Machinery Co., Tiffin, Ohio
Prutton Corporation, Cleveland, Ohio.
Straus-Artys Corp., Great Neck, N. Y.

MACHINERY—Braiding
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Fall, R. I.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Bunching
Cook Mfg. Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Niehaus K. A. Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Vaughn Mach'y Co., Cuyahoga Falls, Ohio

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Carter & Co., Ltd., B. & F., Bolton, England
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corp., New York, N. Y.

MACHINERY—Chain Link Fence
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Steel & Wire Machinery Co., Cleveland, Ohio
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Chain Making
Larmuth and Bulmer, Ltd., Manchester, Eng.
Steel & Wire Machinery Co., Cleveland, Ohio
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Closing Cable
Carter & Co., Ltd., B. & F., Bolton, England
Larmuth and Bulmer, Ltd., Manchester, Eng.
Miyazaki Iron Works, Ltd., Osaka, Japan
Niehaus, K. A. Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Coulter & MacKenzie Machine Co., Bridgeport, Conn.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio

MACHINERY—Cold Heading
Behr Machinery & Equipment Co., Rockford, Ill.
Boltmaster Co., The, Cleveland, Ohio
National Machinery Co., Tiffin, Ohio
Straus-Artys Corp., Great Neck, N. Y.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Herborn Machinery Corporation, Hackensack, N. J.
Johnson Machinery Co., Elizabeth, N. J.
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden
National Mach'y Exch., (Used), New York
Showa Machine Works, Ltd., Osaka, Japan
Steel & Wire Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.
Whitacre Corporation, Alhambra, California

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Cutters, Hydraulic for Rod & Bar
Manco Mfg. Co., Bradley, Ill.

MACHINERY—Dead Block (Stationary Coiler)
Morgan Construction Co., Worcester, Mass.
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Corporation, Alhambra, California
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Descaling Rod, Dry
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fisher Associates, New York, N. Y.
Herborn Machinery Corporation, Hackensack, N. J.
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Diameter Control
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Sjogren Tool & Machine Co., Auburn, Mass.
Wayne Wire Die Co., Linden, N. J.

MACHINERY—Draw Benches
American Laubscher Corp., New York, N. Y.
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Eccentricity Control (Insulated Wire)
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Edging (See MACHINERY—Tandem Rolling and Edging Mills)

MACHINERY—Enameling
Acrometal Products, Inc., Minneapolis, Minn.
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Litzler Co., C. A., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

MACHINERY—Extruding
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Johnson Machinery Co., Elizabeth, N. J.
Royle, John, & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Flat Wire
Fenn Manufacturing Co., Newington, Conn.
Herborn Machinery Corporation, Hackensack, N. J.
Mettler Machine Tool, Inc., New Haven, Conn.
Steel Equipment Company, Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Torrington Mfg. Co., Torrington, Conn.
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Forming Wire
National Mach'y Exch., (Used), New York, N. Y.
Nilson Machine Co., A. H., Shelton, Conn.
Steel & Wire Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Footage Meters
National Standard Electronics Inc., New York, N. Y.

MACHINERY—Galvanizing Wire
Miyazaki Iron Works, Ltd., Osaka, Japan
Ofenbau Fritz G.m.b.H. & Co., K. G., Hagen, (W.-Germany)
Steel & Wire Machinery Co., Cleveland, Ohio
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Whitacre Corporation, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Impregnation Control, Paper Cables
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler Co., C. A., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Insulation Testing (See MACHINERY—Spark Testing)

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia, Pa.
Cook Mfg. Co., The, Paterson, N. J.
Litzler Co., C. A., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

MACHINERY—Lock Washer
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Looms, Wire Weaving
EVG., Machinen & Stahl, A. G., Zurich, Switzerland

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Diam., Insulated Wire
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Larmuth and Bulmer, Ltd., Manchester, Eng.
National Standard Electronics, Inc., New York, N. Y.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Measuring and Control—Coating
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Measuring Width-Flat Wire
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Nail and Tack
Behr Machinery & Equipment Co., Rockford, Ill.
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Co., Tiffin, Ohio
National Mach'y Exch. (Used), N.Y., N.Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Packaging Wire
Advanced Wyrepak Co., Bridgeport, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Whitacre Corporation, Alhambra, California

MACHINERY—Patenting Wire
Ofenbau Fritz G.m.b.H. & Co., K. G., Hagen, (W.-Germany)
Whitacre Corporation, Alhambra, California

MACHINERY—Pin Making
Nilson Machine Co., A. H., Shelton, Conn.

MACHINERY—Plating
Bartell Machine Tool Corp., Rome, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Herborn Machinery Corporation, Hackensack, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch., (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Straus-Artys Corp., Great Neck, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio

MACHINERY—Printing on Electric Wire
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

MACHINERY—Re-Spooling
Acrometal Products, Inc., Minneapolis, Minn.
Associated American Winding Machinery, Inc., New York, N. Y.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Herborn Machinery Corporation, Hackensack, N. J.
Miyazaki Iron Works, Ltd., Osaka, Japan
National Mach'y Exch. (Used), New York, N. Y.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc., (used), Pawtucket, R. I.

MACHINERY—Rod Mill
Baldwin-Lima-Hamilton, Industrial Division, New York, N. Y.
Herborn Machinery Corporation, Hackensack, N. J.
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Fenn Manufacturing Co., Newington, Conn.
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler Co., C. A., Cleveland, Ohio.
Royle, John & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc., (used), Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Slitting Mills
Steel Equipment Company, Cleveland, Ohio

MACHINERY—Special
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Spring Making
Behr Machinery & Equipment Co., Rockford, Ill.
National Mach'y Exch., (Used), New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.
Wafios Machinery Corp., Hackensack, N. J.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Straightening & Cutting
American Laubscher Corp., New York, N. Y.
Behr Machinery & Equipment Co., Rockford, Ill.
Johnson Machinery Co., Elizabeth, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N.Y.
Patterson, George C., Machine Co., Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Wafios Machinery Corp., Hackensack, N. J.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Stranding
Bartell Machine Tool Corp., Rome, N. Y.
Carter & Co., Ltd., B. & F., Bolton, England
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Phila., Pa.
Johnson Machinery Co., Elizabeth, N. J.
Krupp, Fried., Machienn-Und Stahlbau Rheinhausen, Germany
Larmuth & Bulmer Ltd., Manchester, Eng.
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Tandem Rolling & Edging Mills
Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Take-Up and Pay-Out
Acrometal Products, Inc., Minneapolis, Minn.
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
American Insulating Mach'y Co., Phila., Pa.
Associated American Winding Machinery, Inc., New York, N. Y.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Johnson Machinery Co., Elizabeth, N. J.
Larmuth & Bulmer Limited, Manchester, England
Litzler Co., C. A., Cleveland, Ohio.

Miyazaki Iron Works, Ltd., Osaka, Japan
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine) France
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Corporation, Alhambra, California

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine) France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Thread Rolling
Behr Machinery & Equipment Co., Rockford, Ill.
Boltmaster Co., Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Prutton Corporation, Cleveland, Ohio.
Straus-Artys Corp., Great Neck, N. Y.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Tinning Wire
American Insuating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Litzler Co., C. A., Cleveland, Ohio
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Corporation, Alhambra, California

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Tube Mill, Cold Drawing
Johnson Machinery Co., Elizabeth, N. J.
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N.J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
Johnson Machinery Co., Elizabeth, N. J.
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Welded Wire Mesh
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Schlatter, Ltd., H. A. Zollikon/Zurich
Sommer Products Company, Peoria, Ill.

MACHINERY—Variable Speed Drives
Allis Co., Louis, Milwaukee, Wisc.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery—Welding Wire Fabrics)

MACHINERY—Winding Wire
Associated American Winding Machinery, Inc., New York, N. Y.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Larmuth and Bulmer, Limited, Manchester, England
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Laubscher Corporation, New York, N. Y.
Behr Machinery & Equipment Co., Rockford, Ill.
Cook Manufacturing Co., The, Paterson, N.J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fenn Manufacturing Co., Newington, Conn.
Herborn Machinery Corporation, Hackensack, N. J.
Johnson Machinery Co., Elizabeth, N. J.
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Miyazaki Iron Works, Ltd., Osaka, Japan
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Showa Machine Works Ltd., Osaka, Japan
Societa Generale Delle Macchine Mill, Milan, Italy
Steel Wire and Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Superior Tool & Machinery Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.
Whitacre Corporation, Alhambra, California
Wire Machinery Inc., Chicago, Ill.

MACHINERY—Wire Preheating
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Wire Rope
Larmuth and Bulmer, Ltd., Manchester, Eng.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
American Laubscher Corp, New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio

MOTORS—Electric
Allis Co., Louis, Milwaukee, Wisc.

NAIL TOOLING—Tungsten Carbide
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Central Tool and Mach. Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Co., Winsted, Conn.
Michigan Oven Company, Detroit, Mich.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAPER—Coil Wrapping
Ludlow Papers, Needham Heights, Mass.

PAPER—Insulating
Ludlow Papers, Needham Heights, Mass.
Plymouth Cordage Company, Plymkraft Division, Plymouth, Mass.
Twitchell, Inc., E. W., Philadelphia, Pa.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Cary Chemicals, Inc., New Brunswick, N. J.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

PLASTICS—for Wire Insulation
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Dow Corning Corporation, Midland, Mich.
Escambia Chemical Corp., New York, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Union Carbide Plastics Company, Div. of Union Carbide Corporation, New York, N. Y.
Union Carbide Corporation, Silicones Division, New York, N. Y.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck, Chemical Division, Naugatuck, Conn.

PRINTING WHEELS—for Electric Wire
Daniels & Co., Frank, New York, N. Y.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., Inc., West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

PULLERS AND GRIPS—for Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool & Mach. Co., Auburn, Mass.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio

RACKS—Wire Storage
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Acrometal Products, Inc., Minneapolis, Minn.
Mettler Machine Tool, Inc., New Haven, Conn.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Wardell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Berger Div., Canton, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.

REELS—Plywood
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark Manufacturing Co., J. L., Rockford, Illinois
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Steel, for Rope and Cable
New York Engineering Corp., Yonkers, N. Y.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Nelson Co., The, Baltimore, Md.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Wood Working Co., Montello, Wisc.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Nelson Co., The, Baltimore, Md.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Marathon Specialty Steels, Inc., N. Y., N. Y.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Detroit Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Huette, A. G., Duisburg, Germany
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

ROPE—Wire
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons, Div., Colorado Fuel & Iron Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Removing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SATURATION SYSTEMS—
Watson Machine Co., Paterson, N. J.

Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

SILICONE RUBBER—For Wire Insulation
Dow Corning Corporation, Midland, Mich.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—For Retail Sale of Wire
American Wood Working Co., Montello, Wisc.
Clark Manufacturing Co., J. L., Rockford, Illinois

SPOOLS—Plastic
Associated American Winding Machinery, Inc., New York, N. Y.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
Plastic Mold & Eng. Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

STAMPINGS—Steel
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

STOCK STORAGE SYSTEMS—
Jarke Manufacturing Co., Chicago, Illinois

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.

TANKS—Ceramic, for Galvanizing
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TENSION METERS—for Wire
Boulin Instrument Corp., Pelham, N. Y.
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
Tensitron, Inc., Harvard, Mass.

TESTERS—INSULATION
(See Testing Equipment—for Dielectric Faults)

TESTING EQUIPMENT—Dielectric Faults in Insulation
Davis Electric Co., Wallingford, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
Peschel Electronics, Inc., Patterson, N. Y.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

TESTING EQUIPMENT—Physical
Scott Testers, Inc., Providence, R. I.

TINSEL—Electric Conductor
A. C. S. Industrial Div., American Copper Sponge Co., Inc., Woonsocket, R. I.
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL-Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

TRANSMISSIONS—Variable Speed (See Adjustable Speed Drives)

TRAVERSE & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Associated American Winding Machinery, Inc, New York, N. Y.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

VARNISHES & LACQUERS—for Electric Wire
General Electric Company, Insulating Materials Section, Schenectady, N. Y.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

WAXES—for Insulated Wire
Cary Chemical Inc., New Brunswick, N. J.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Herborn Machinery Corporation, Hackensack, N. J.
Micro Products Co., Chicago, Ill.
Schlatter, Ltd., H. A., Zollikon-Zurich

WHEELS—for Printing on Electric Wire
Daniels & Co., Frank, New York, N. Y.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

WIRE—Aluminum
Hudson Wire Co., Ossining, N. Y.
Malin & Co., The, Cleveland, Ohio

WIRE—Ball
Marathon Specialty Steels, Inc., N. Y., N. Y.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brake Lining
Hudson Wire Co., Ossining, N. Y.

WIRE—Brass and Bronze
Malin & Co., The, Cleveland, Ohio
Wisconsin Wire Works, Appleton, Wis.

WIRE—Brush
Hudson Wire Co., Ossining, N. Y.

WIRE—Bunched and Stranded
Camden Wire Co., Camden, N. Y.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Copper
Camden Wire Co., Camden, N. Y.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., The, Cleveland, Ohio

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.

WIRE—Flat
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Montgomery Co., The, Windsor Locks, Conn.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Detroit Steel Corporation, Detroit, Mich.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Manufacturers
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Coroporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Marathon Specialty Steels, Inc., N. Y., N. Y.
Republic Steel Corp., Berger Div., Canton, Ohio
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div. The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Metalizing
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Malin & Co., The, Cleveland, Ohio

WIRE—Needle
Marathon Specialty Steels, Inc., New York, N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Alloy
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wisconsin Wire Works, Appleton, Wis.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., The, Cleveland, Ohio
Wisconsin Wire Works, Appleton, Wis.

WIRE—Oil Tempered
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Special Shapes
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel & Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Wisconsin Wire Works, Appleton, Wis.

WIRE—Stainless Steel
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Malin & Co., The, Cleveland, Ohio
Marathon Specialty Steels, Inc., New York, N. Y.
Nippon Stainless Steel Wire Mfg. Co., Ltd., Osaka, Japan.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wisconsin Wire Works, Appleton, Wis.

WIRE—Steel—Also Coppered and Galvanized Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel & Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Malin & Co., The, Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Straightening and Cutting
Colorado Fuel & Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Wisconsin Wire Works, Appleton, Wis.

WIRE—Stranded & Bunched
Hudson Wire Co., Ossining, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide Rolls, Bushings, Wear Parts, etc.
American Wood Working Co., Montello, Wisc.

WRAPPING PAPER—Creped
(See PAPER-Creped Wrapping)

YARN TESTERS—
National Standard Electronics, Inc., New York, N. Y.
Scott Testers, Inc., Providence, R. I.

YARNS—Wire Insulating
Chadwick Yarn Company, Pawtucket, R. I.
Synthetic Thread Co., Bethlehem, Pa.

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7 SPOOL 7" DIA. VL3-1 WITH CLOSE-COUPLED CAPSTAN 12" AND TAKEUP 30" →

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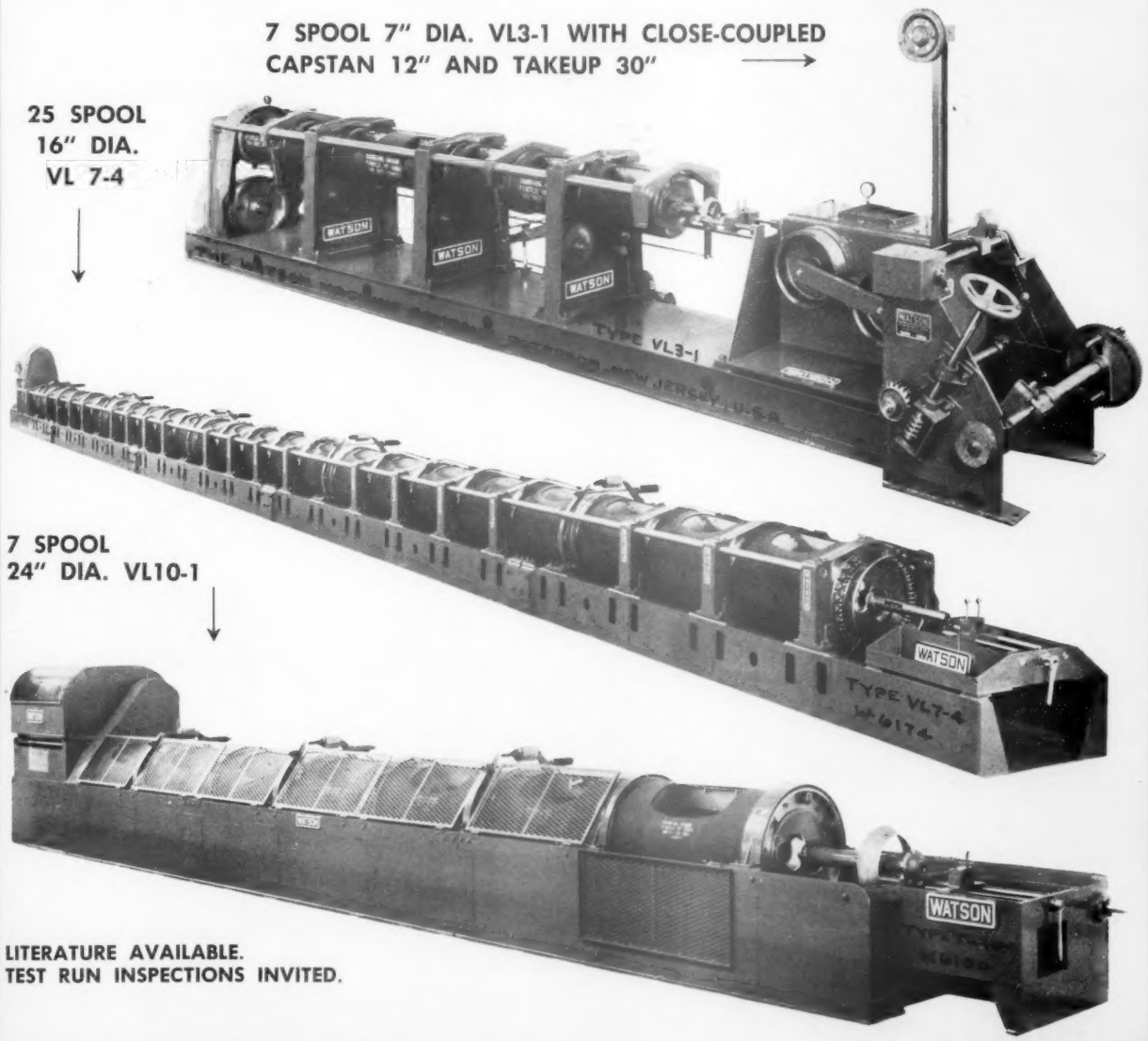

7 SPOOL 24" DIA. VL10-1 ↓

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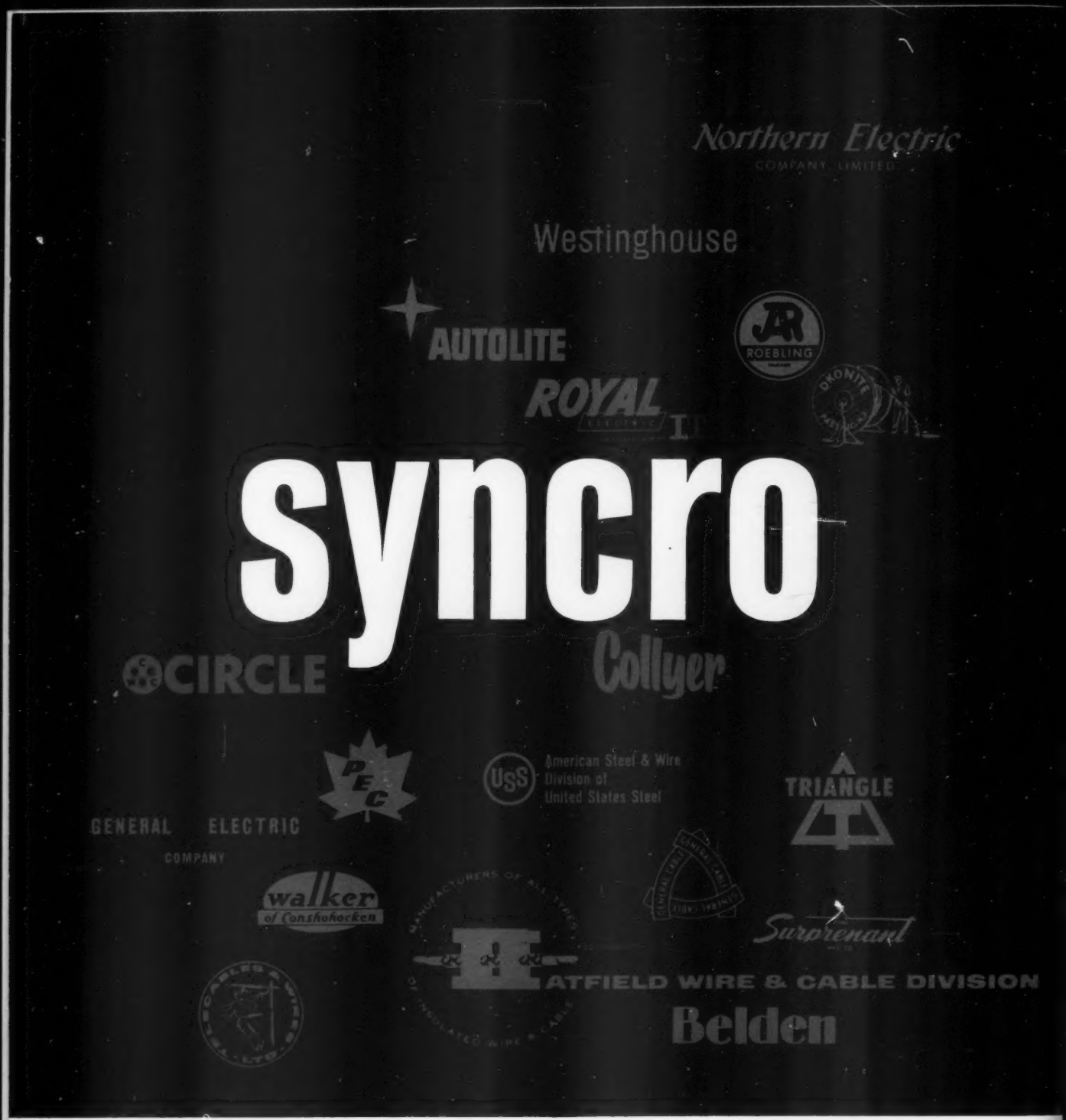

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